BUREAU OF MATERIALS & RESEARCH

EXPERIMENTAL FEATURE No. EF 2016-01

Evaluation of Thermion SafTrax TH604 coating system on Acrow Temporary Bridge Deck Panels NHDOT Project 14957 Lebanon-Hartford, VT

Installation/Interim/Final Report Date: May 2020

Introduction

The contract for New Hampshire Department of Transportation (NHDOT) Project 14957, Lebanon, NH - Hartford, VT (Fed. Project No. A000(627)), included the use of an Acrow temporary pony truss bridge to accommodate detoured traffic around the bridge construction site. After the new bridge was completed, the Acrow bridge was dismantled for storage. The Acrow 700XS steel deck panels were to be re-coated using an epoxy-urethane water proofing overlay, PolyCarb Flexogrid. Due to the poor performance of this coating (Figure 1), a change order was issued to remove the remaining PolyCarb Flexogrid and apply Thermion SafTrax TH604 metallizing with a clear seal coat. (Appendix A, 14957 Lebanon, NH - Hartford, VT Change Order #16, approved by NHDOT 2/25/2016).

Figure 1. PolyCarb Flexogrid delamination on the Acrow temporary bridge deck panels

Objective

The objective of this research is to document the application and performance of the Thermion SafTrax TH604 metallizing system on the Acrow temporary bridge panels. The performance of SafTrax will be evaluated and documented for a period of in-service use as described in the Experimental Feature Work Plan EF 2016-01 included as Appendix B. The research results will be used to evaluate this product as an effective corrosion resistant protective coating for smooth steel surfaces used in areas of vehicular and pedestrian traffic, particularly in areas of heavy truck traffic.

Product Description

Thermion SafTrax TH604 is a ceramic oxide core wire composed of aluminum and up to 46 percent by volume of ceramic oxides. The product data sheet is included as Appendix C. The aluminum serves as a binder for the ceramic and provides the corrosion protection and adhesion to the underlying material, and the ceramic component provides wear-resistance and nonskid surface roughness. A sealer coat is recommended to reduce porosity and improve adhesion. This ceramic oxide thermal sprayed coating system is expected provide a wear-resistant surface on the steel panels that is long lasting and protects the substrate from corrosion while maintaining an average coefficient of friction of 1.1 to improve skid resistance.

Research Approach

Pre-construction Meeting

A demonstration of the SafTrax coating process on two Acrow panels was performed on April 15, 2016, by Excelerated Coatings, a division of Fletch's Sandblasting & Painting, Inc. (FSP) at their facility in Epsom, New Hampshire (Appendix D, Pre-construction Meeting Memorandum). Action items resulting from the meeting after the demonstration were transmitted via email and approved by NHDOT Bridge Design on May 17, 2016 (Appendix E, FSP Metallizing Procedure, Revision 3). Items included are the FSP coating procedure and data sheets for the Thermion SafTrax TH604 metallizing and Wasser MC-Clear 100 urethane sealing coating.

Application

FSP coated 185 Acrow deck panels between May 25, 2016 and August 24, 2016. The application adhered to the Joint Standard, SSPC-CS 23.00. Each panel was blast cleaned using manual blast equipment with iron-silicate blast media (30/60 abrasive mix) and the profile depth was measured and verified to be within the 3 to 5 mil specified range. The Thermion SafTrax TH604 metallizing was applied and the dry film thickness was measured. The thickness was verified to meet the required minimum of 15 mils and measured an average of 25.6 mils. Wasser

MC-Clear 100 urethane sealing coating was then applied at a minimum thickness of 1.5 mils to complete the coating system process.

Figure 2. SafTrax coating process performed by Excelerated Coatings in Epsom, NH

Destructive testing was performed each day before production began consisting of five metallized thin metal strips bent 180 degrees around a mandrel, pull-off adhesion tests and a chisel test on a small metallized plate. All specimens passed the bend, adhesion, and chisel tests. The adhesion exceeded the required minimum of 1,000 psi and measured an average of 2,958 psi.

An example of a FSP quality control report is included as Appendix F, FSP Daily Coating Inspection Reports (Panels 148-159). An independent inspection, furnished by Bridge Design, was performed periodically by a representative of Greedman-Pedersen, Inc. (GPI). An example of a GPI inspection report is included as Appendix G, GPI Daily Inspection Reports (Panels 120-158). The full set of inspection reports for all panels and the associated dry film test information is available upon request from NHDOT.

UNH Laboratory Testing

The skid resistance performance of a bridge deck panel coated with SafTrax TH604 system was studied by University of New Hampshire (UNH) in the laboratory in spring 2017. The objective of the NHDOT Bridge Deck Friction Treatment study was to assess the bridge deck surface macrotexture and frictional properties. The results of the testing are presented in the UNH report, NHDOT Bridge Deck Friction Treatment (Haslett, 5/1/2017), included as Appendix H. To evaluate the durability, values from this study were compared to testing performed on the panels after being exposed to traffic and weathering in the field.

Installation

The driveway of the NHDOT maintenance shed in Newfields, New Hampshire, was selected for installation and testing of four (4) panels. Various parameters such as soil type, traffic volume (including truck volume), and drainage conditions were taken into account in site selection.

Figure 3. The panel installation at the NHDOT maintenance shed in Newfield, NH

The bridge mock-up that included the panel installation was constructed by the Bureau of Bridge Maintenance and was documented by UNH as an independent study and a senior project for civil engineering undergraduate students. This is described in report, Assessment of Bridge Deck Friction Treatment for NHDOT (UNH, 2018-2019), included as Appendix I. Panel 4 was identified as the panel that was previously tested in the UNH laboratory. The test panels at the Newfields site were trafficked from installation in November 2017 until removal in May 2018.

Evaluation

UNH student researchers measured the following properties of the bridge deck surface prior to trafficking (December 2017) and after a winter season (April 2018):

- macrotexture – pavement macrotexture depth measured using a volumetric technique (ASTM E965-15)
- frictional properties – surface frictional properties measured using the British pendulum tester (ASTM E303-93)

The bridge deck surface parameters documented included:

- visual appearance of the coating
- loss of non-skid texture
- surface wear
- adhesion to the steel panel

A motion-activated trail camera was used to monitor traffic over the bridge. Researchers documented the number of vehicle passes and the number of times the panels were plowed. Vehicular traffic during the five (5) months was approximately 5,400 of which 10 percent were snow plows.

Figure 4. Post-trafficking images of Acrow bridge panels with Thermion SafTrax TH604 Metallized Coating

Test results for macrotexture and friction values, prior to trafficking and post-trafficking, are presented in the UNH report (Appendix H). The panels had an excellent macrotexture depth and frictional properties prior to trafficking, superior to that expected for asphalt pavement surfaces. After trafficking for five months both of these tested parameters indicated deterioration of the system. Additional information on the evaluation of the performance of the panels is presented in Appendix I, Assessment of Bridge Deck Friction Treatment for NHDOT (UNH, 2018-2019) and in Appendix J, NHDOT Bridge Design Evaluation of Thermion SafTrax TH604 Metallized Coating for Acrow Deck Panels (J. Zoller, 1/16/2020).

Summary and Conclusion

The UNH study summarizes the before and after trafficking macrotexture depth (MTD) and British Pendulum Number (BPN) in Table 1 and Table 2 of their report (Appendix I). The BPN is a measure of microtexture, a frictional property of surfaces.

Table 1: Summary table of macrotexture depth

Macrotexture Depth (MTD) (Sand Patch Test)			
Panel	Pre-Trafficking MTD Average (mm)	Post-Trafficking MTD Average (mm)	% Change (loss)
1	0.450	0.247	45.0
2	0.462	0.175	62.2
3	0.463	0.190	59.1
4	0.465	0.251	46.0
Average:	0.460 (18.5 mil)	0.216 (8.7 mil)	53.1 %

Table 2: Summary table of British pendulum testing

Microtexture Depth (British Pendulum Test)			
Values in BPN (British Pendulum Number)			
Panel	Pre-Trafficking BPN Average	Post-Trafficking BPN Average	% Change (loss)
1	115.5	73.0	36.8
2	112.4	61.0	45.7
3	113.7	61.5	45.9
4	109.8	79.0	28.1
Average:	112.9	68.6	39.1 %
Note: A section of the overlay that was visibly removed by plowing during the study was tested and had an average BPN value of 44.			

Although the percent change indicates a loss in MTD, the post-trafficking MTD values are still high for a coating (Appendix J, p. 4-5). The percent change in BPN values, although significant, results in an average post-trafficking level of 68.6 BPN, just below the range of 75 to 80 for concrete characterized as having good anti-skid properties. (Appendix J, p. 5-6). Upon visual inspection, the areas where the coating was completely removed due to snowplowing were located primarily along the raised panel edges. The coating that remained was well adhered (Appendix J, p. 7). Damage to the coating due to snowplow scraping would be expected for any coating.

In conclusion, the test results and visual inspection indicate that steel deck panels with the Thermion SafTrax TH604 coating are recommended for installation on a temporary bridge to be used over a winter without an asphalt wearing surface.

APPENDICES

- Appendix A: 14957 Lebanon, NH - Hartford, VT Change Order #16
- Appendix B: Experimental Feature Work Plan EF 2016-01
- Appendix C: Thermion SafTrax TH 604 Product Data Sheet
- Appendix D: Pre-construction Meeting Memorandum
- Appendix E: FSP Metallizing Procedure, Revision 3
- Appendix F: FSP Daily Coating Inspection Reports (Panels 148-159)
- Appendix G: GPI Daily Inspection Reports (Panels 120-158)
- Appendix H: NHDOT Bridge Deck Friction Treatment, University of New Hampshire (Haslett, 5/1/2017)
- Appendix I: Assessment of Bridge Deck Friction Treatment for NHDOT, University of New Hampshire (Haslett, Caron, Lamontagne, Dave, 2018-2019)
- Appendix J: NHDOT Bridge Design Evaluation of Thermion SafTrax TH604 Metallized Coating for Acrow Deck Panels (J. Zoller, 1/16/2020)

APPENDIX A

14957 Lebanon, NH - Hartford, VT Change Order #16

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
BUREAU OF CONSTRUCTION

February 18, 2016

APPROVED
Bridge Engineer
Federal Highway Administration
Date: 2/25/16

To: **CPM CONSTRUCTORS**. You are hereby notified to perform the following work in accordance with the provisions of your contract with the Department dated ***August 14, 2013***.

Change Order # 16

Lebanon, NH - Hartford, VT	**A000(627)**	**14957**
Project Name	Federal No.	State No.

Payment will be made by: ☐ Bid Prices ☒ Supplementary Agreement (Agreed Prices) (Engineer's Estimate Required) ☐ Force Account (Time & Materials) (Engineer's Estimate Required)

DESCRIPTION: This work shall consist of all labor, equipment, and materials to remove the existing Epoxy-Urethane waterproofing overlay on the 180 Acrow steel deck panels, surface preparation, and application per manufactures specifications of Thermion SafeTrax TH604 metalizing with a clear seal coat. Trucking of panels to the facility for metalizing is included, but finished panel delivery to the Bridge Maint. Yard in Franklin, NH is subsidiary to Item 501.1009, Removal of Existing Bridge Structure (Partial Salvage to NHDOT).

REASON: The epoxy-urethane, as specified per the Contract, has failed as a protective coating and has de-bonded from the deck panel surface. This exposes the surface to corrosion and does not provided a non-skid surface for safe passage of vehicles. The use of a metalized waterproofing, as requested by NHDOT Bridge Maintenance, will provide a durable and non-skid coating that will reduce operating costs, increase service-life, and provide a safe non-skid panel surface.

Item No.	Description	Appn Code	Unit	Estimated Quantity	Unit Price Agreed	Unit Price Per Bid	Estimated Cost
	Original Design						
540.1	Epoxy-Urethane Water Proofing Overlay for Bridge Decks	VT02	SY	1850		$90.00	($166,500.00)
	Revised Design						
540.11	Metalizing Water Proofing Overlay for ACROW bridge deck	VT02	SY	1200	$224.01		$268,814.00
						TOTAL	$102,314.00

Federal Participation Requested: Yes

Contract Extension Granted: No

Working Days Authorized: 0

Contractor: **CPM Constructors, INC.**

S.A. Approved by: _____
Contractor's Representative

_____
for Christopher Waszczuk, P.E.
NHDOT Director of Project Development

Do Not Write Below This Line - For Office Use Only

FHWA ___ PRIME ___ CONT. ADMIN. ___ FINANCE & CONTRACTS ___ DATE _____

APPENDIX B

Experimental Feature Work Plan EF 2016-01

EXPERIMENTAL FEATURE WORK PLAN

EF 2016-01

Evaluation of coating on Acrow Temporary Bridge Deck Panels

Lebanon-Hartford, VT A000(627), 14957

OBJECTIVE

The objective of this research is to document the installation and performance of Thermion SafeTrax TH604 on the steel deck panels of the Department owned Acrow temporary bridge on the Lebanon-Hartford, VT 14957 project. Currently the panels non-skid coating (PolyCarb Flexogrid) has failed and is delaminating from the wheel paths as well as areas outside the wheel paths. This failure can lead to hazardous traffic conditions and affect the service life of the panel by exposing them to corrosion. The temporary bridge is not in service at this time and is being dismantled for storage and future use at other locations. The Contract work required the deck panels to be re-coated using an Epoxy-Urethane Water Proofing Overlay (PolyCarb Flexogrid) which has been determined to not withstand the repeated flexure of the steel panels and de-bonds from the panels steel surface. The New Hampshire Department of Transportation plans to remove the remaining PolyCarb coating and apply Thermion SafeTrax TH604 metallizing as a non-skid and corrosion protective surface. The performance of SafeTrax will be evaluated and documented for a period of in-service-use of 5 years

The Thermion SafeTrax TH604 is advertised as a wear resistant thermal coating for aluminum, steel and stainless steel that is long lasting and protects against corrosion while maintaining an average coefficient of friction of 1.1. Previously the Department has experimented with thermal spray coatings to protect steel bridge components from corrosion and increase service life and reduce operating costs.

APPROACH

Thermion SafeTrax TH604 was selected as an experimental non-skid corrosion protection coating system for a wearing surface on the steel deck panels. TH604 is a ceramic oxide core wire composed of aluminum and up to 46% by volume of ceramic oxides. The ceramic composite is to provide wear resistance and non-skid properties. The aluminum serves as a binder for the ceramic and provides the corrosion protection to the steel. Coating properties include; High Bond Adhesion Strength (2500 psi), resistance to wear and impact, withstands flexing, resists oils and fuels, unaffected by weather and sun, resistant to cracking. A sealer coat is required when applying to steel to reduce porosity and improve adhesion.

The PolyCarb Flexogrid will be removed from the steel deck panels with scrapers and chipping hammers, bevel any sharp edges with grinder. The panel deck surface will be grit blasted to a minimum SP 10 cleanliness to remove any residual PolyCarb, oils, rust, and other foreign substances. The blasting shall provide to the steel panel an angular profile surface of 3-5 mils per Thermion SafeTrax TH604 requirements. Apply non-skid coating (15 – 20 mil) using Twin Wire Arc Spray Process, and apply sealer. Work is to be performed in conformance with Joint Standard, SSPC CS 23.00/ AWS C2.23/ NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metallizing) and Thermion SafeTrax TH604 manufacturer specifications.

EVALUATION

The evaluation will consist of observation and documentation of the preparing of the steel deck panel surfaces and the application of the Thermion SafeTrax TH604 metallizing and sealer. Ambient conditions, surface preparation, and equipment and materials used will be documented. Periodic inspections will be performed throughout a period of no less than 5 years. Parameters to be monitored include the visual appearance of the coating, loss of non-skid texture, wear, adhesion to the steel panel. An evaluation report will be written to summarize each inspection.

SCHEDULE AND COMPLETION DATE

Thermion SafeTrax TH604 Application	February – March 2016
Periodic Evaluation	Annually 5 Years duration

ESTIMATED COSTS

The unit price is $161.96/SY (Total $194,350.00)

IMPLEMENTATION

Research results will be of use in evaluating if this product is an effective corrosion resistant protective coating with non-skid properties for smooth steel surfaces used in areas of vehicular and pedestrian traffic, especially in areas of heavy truck traffic.

Submitted By: _____ Date: 2/25/16

Ann Sholtz, Research Engineer NHDOT

Approved: _____ Date: 2/25/16

FHWA NH Division

APPENDIX C

Thermion SafTrax TH 604 Product Data Sheet

SAFTRAX™
a Thermion® Nonskid Product

TH604 is a ceramic oxide core wire composed of aluminum and up to 46% by volume of ceramic oxides. This is a "patented" process, which allows for a high percentage of ceramic within an aluminum matrix.

The purpose of this wire is to provide a wear resistant surface to aluminum, steel and stainless steel that is long lasting and protects against corrosion while maintainig an average coefficient of friction of 1.1.

USES:

- Anti-slip coatings for pedestrian traffic and personnel safety on boat decks, flooring, steps, ladders, walkways, scaffolding, etc. Particularly steel and aluminum substrates subject to corrosion.
- Anti-skid coatings for car/truck ramps, forklift loading ramps, aircraft landing areas, or any application requiring both nonskid and corrosion protection.
- To control corrosion, wear, abrasion, and impact. When applied to a steel substrate this material will provide corrosion protection and wear resistance properties. It provides equal corrosion protection as that of pure aluminum and wear resistance far superior to that of any material presently known to have both these unique properties. Application environment could include river flow, water slurry, wind blown sand, tidal flows etc.

APPLICATION:

This material was developed for cost effective production application. It is available and stocked in 1/8" (3.2mm) and can be made special ordered in 3/16" (4.8mm).

APPLICATION	Bond Strength	Coverage ft^2/lb	Coverage ft^2/hr
Anti-slip (aluminum)	2000 psi	14	350
Anti-slip (Steel)	2000 psi	8	240
Wear/Corrosion	2000 psi	5	140

- It is normally recommended to apply a sealer coat over a thermal sprayed coating that is applied to steel. The Anti-slip coating system will accept this sealer coating without degradation to the Anti-slip properties.
- The Ceramic Core material is applied with higher density to obtain the maximum wear for high surface contact areas.

5813 NE Minder Rd ☐Poulsbo, WA 98370 ☐Toll Free 877-884-3428 ☐ www.thermioninc.com

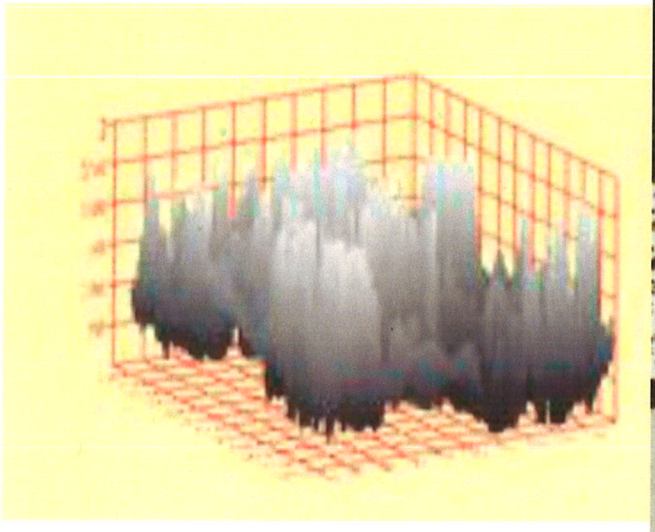
QUALITY ASSURANCE OFFICE
Laboratory Division

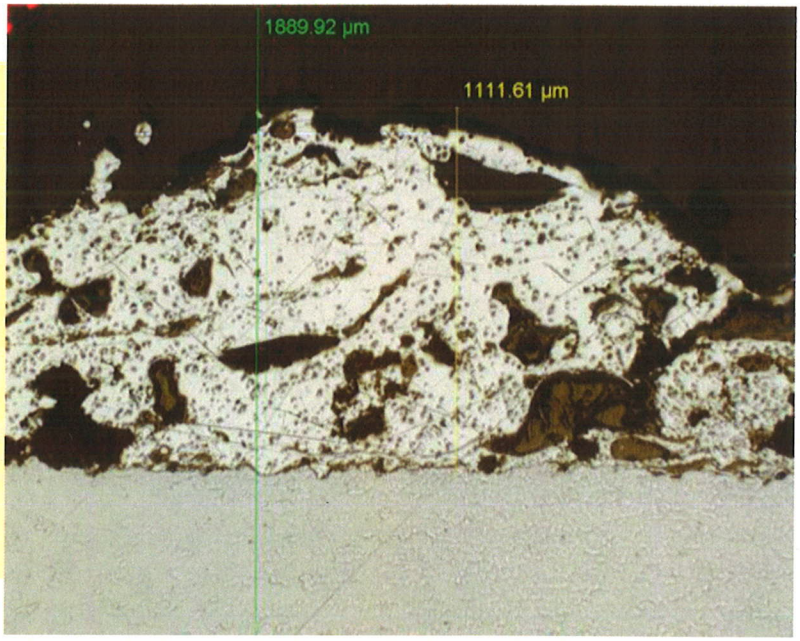
Specification: MIL-STD-1687/UIPI 0074-902

Number of Samples: 6

COATING TYPE: TH-604 CERAMIC CORE WIRE ON Cfe NON SKID WITH ARC WIRE PROCESS

TEST NUMBER: **TH604**





TENSILE TEST:

SAMPLE NUMBER	BREAKING LOAD LBS.	TENSILE STRENGHT PSI	FAILURE LOCATION
1	1359	1730	COATING
2	1707	2173	COATING
3	1391	1771	COATING
4	1431	1822	COATING
5	1961	2497	COATING
6	1920	2445	COATING
Average Coating:	1628 lbs.	2073 psi	100% Cohesive Failure
Standard Deviation:	271 lbs.	346 psi	

REQUIRED BOND: 1500 PSI MINIMUM AND 2000 PSI AVERAGE MINIMUM

Bend Test:
Bend Range: 180 degrees
Bend Radius: ¼ inch

5813 NE Minder Rd ☐Poulsbo, WA 98370 ☐Toll Free 877-884-3428 ☐ www.thermioninc.com

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Call Us: 877.884.3428

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Arc Spray Systems
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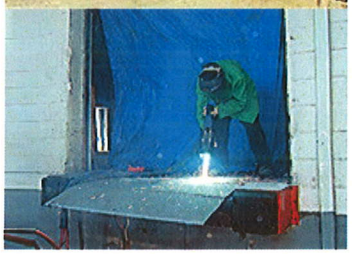
Buy Back Program

MADE IN THE USA

Non Skid Aluminum Spray Coating



TH604 Anti-Slip & Anti Corrosion System

The purpose of the ceramic composite coating is to provide a wear resistance surface while also providing corrosion protection of the coated object. The coating material, a "Ceramic Core" tubular **non slip / anti skid aluminum spray wire** is filled with up to 46% ceramic, when sprayed onto an object produces a ceramic composite coating of aluminum and ceramic. The aluminum spray wire serves as a binder for the hard ceramic and provides the corrosion protection to the underlying article, the ceramic material provides for wear resistance and adds long life to the coating.

The twin wire arc spray process is used to apply the material and form a coating, this process is simple, easy to learn, highly productive, and economical to operate. The process can be controlled to produce coatings with a surface profiled of different degree of roughness from slight to a very aggressive rough surface. Aluminum spray wires are known to provide long term corrosion protection to steel and this material duplicates the long-term protection plus the benefits of high wear properties. This coating system is especially beneficial for use on steel and aluminum, however it can be applied to other metals and materials, including concrete and plastics.

* required field

Name *

Email *

Phone

Have a Question? *

To submit this form, please enter the characters you see in the image:

View our Saftrax Nonskid Product Brochure

Coating Qualities

- Continuous Safe Conditions For Customers, Personnel & Vehicle Traffic
- Affordable
- Long Lasting (10 years min.)
- Attractive
- Can Be Cleaned By Scrubbing and/or Pressure Washing
- Protects Steel Surface From Corrosion
- Will Not Peel Due to Undercoat Corrosion
- Applicable to Steel and Aluminum

Coating Method

- 240 Ft2/Hr
- Low Operational Costs ($1.00 Per/Hr)
- Simple Operation (Low Skill Level)
- Operates From Existing Commercial Services
- Industrial Designed With Robust Features
- Simple and Easy Maintenance & Repair

Coating Procedure

- Prepare surface by Grit blasting or grinding on Aluminum
- Apply non slip coating using Twin Wire Arc Spray Process

- Apply Sealer

Coating Properties

- High Bond Strengths (2500 psi) using portable tester
- Resistant To Wear (Ceramic Rc60+)
- Resistant to Impact (Passes US Navy Ball Drop Test)
- Withstands Flexing (Passes Bend Tests)
- Resists Oils and Fuels
- Coefficient of Friction (1.1 average)
- Unaffected By Weather or Sun
- Resistant to Cracking

Benefits of Coating System

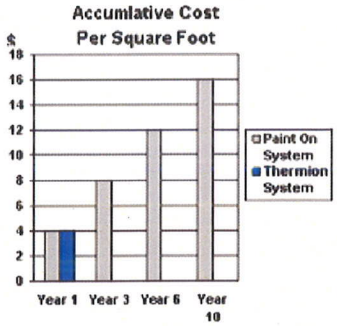
- Continuous Safe Non-Slip Surfaces
- Variable Surface Textures and Profiles
- Usable on All Metals
- Immediately Usable No Cure Time
- Apply at all Temperatures
- Use in all Weather Environments
- Can be Colored
- No VOCs
- Highly Wear Resistant and Long Lasting
- Low Tech Application Methods
- Not Environmentally Sensitive
- Non Hazardous and Non Combustible Coating

Application Details

- Bond Strength up to 2,000 PSI
- Spray Rate 240 Ft2/Hr
- Coverage 3-12 Ft2/Lb
- Material Costs $1.10-$4.30 Per Ft2

Life Cycle Cost

- Low Initial Application
- 10 Year Life Expectancy
- No Maintenance Required
- Damage Resistant
- Lawsuit Resistant
- Permanently Safe Surface



ph: 360.692.6469 | fx: 360.447.8314
tf: 877.884.3428

APPENDIX D

Pre-construction Meeting Memorandum

STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

DATE: April 15, 2016

AT: Construction Bureau

FROM: Shaun M. Flynn, P.E.
District Construction Engineer

SUBJECT: **Lebanon-Harford, VT 14957**
Metallizing Bridge Maintenance ACROW deck panels

TO: Construction Files
via
Theodore Kitsis, P.E.
Administrator

MEMORANDUM

On Friday, April 15, 2016, a pre-construction meeting for the application of Thermion Saftrax TH604 (Metallizing Water Proofing Overlay for ACROW deck panels) was attended by:

NAME	ORGANIZATION	E-MAIL ADDRESS
Shaun Flynn	NHDOT – Construction	sflynn@dot.state.nh.us
Tim Letton	GPI – Coating Inspection	tletton@gpinet.com
Kraig Gonyo	GPI – Coating Inspection	kgonyo@gpinet.com
Dean Wilson	NHDOT – Construction	dwilson@dot.state.nh.us
Steve Johnson	NHDOT – Bridge Maint.	sjohnson@dot.state.nh.us
Jerry Zoller	NHDOT – Bridge Design	jzoller@dot.state.nh.us
Jeff McGuire	CPM	jmcguire@cpmconstructors.com
Rich Luding	Enhanced Surface Solutions	rluding@thermion.com
Dan Bernard	CPM	dbernard@cpmconstructors.com
Peter Nicolopoulas	Fletch's/Excelerated Coatings	pete@ecoatings.com
Sean Fletcher	Fletch's/Excelerated Coatings	sean@ecoatings.com

An on-site meeting and tour of the Fletch's / Excelerated Coatings facilities at 52 Shirkin Road, Epping, NH was conducted to review the ACROW deck panel Saftrax coating process and introduce all parties involved.

Two deck panels were set-up for a demonstration. One panel was prepared with a surface profile of 3 – 5 mils and coated with 15 – 20 mils of the Saftrax TH604

metalizing coating and half of the surface had the sealer applied. The second panel was prepared with a surface profile of 3 – 5 mils and then a demonstration of the coating process was performed to produce a 15 – 20 mil coating.

Following the demonstration a meeting was held to discuss procedures and requirements.

The following action items need to be address and submitted to the NHDOT prior to the start of the production phase of coating the panels;

- A written work plan that includes step-by-step instructions for surface preparation, coating application, and sealing of the panels, including details on the allowed times between preparation, coating, and sealing, and protective measures for handling and stacking of completed panels.
- A written Quality Control plan highlighting the testing methods and procedures.
- Additional information on the copper slag abrasive being used for preparation of the panels and it's abilities to meet the 3 – 5 mils angular profile recommended.
- Data sheets for the sealer or sealers being used and a letter of recommendation from the coating manufacturer.

SMF/s
cc: Attendance List

i:\projects\lebanon\14957\corresp\sa\deck panel coating\lebanon 14957 mtg minutes fletch termion saftrax th604 pre-production.doc

APPENDIX E

FSP Metallizing Procedure, Revision 3

From:
Jerry Zoller

May 17, 2016
2:30 pm

— 15 pages —

From: Dan Bernard <dbernard@cpmconstructors.com>
Sent: Tuesday, May 17, 2016 12:49 PM
To: Jeffery Potter
Cc: Shaun Flynn; Jerry Zoller; Peter Krakoff; Jeff McGuire; pete@ecoatings.com
Subject: NHDOT 14957 - trans#163 - Fletch's Metallizing Procedure - Rev#3
Attachments: Wasser Procedure 5-10-16 Revised.pdf; ATT00097.pdf; MaxiBlast COA-FR.pdf; MaxiBlast MSDS.pdf; NHDOT 14957 - trans#163 - Fletchs Metallizing Procedure - REV#3.pdf; SAFTRAX-Brochure.pdf; TH604 Application Data.pdf; Wasser MC Clear 100 urethane sealer.pdf

To:

for ACROW Deck Panels

Jeff,

Please find attached transmittal #163 and Revision #3 of the metallizing procedure from Fletch's.

Pete performed some bend tests that resulted in cracking but no spalling or separation of the TH-604 from the base, so he got rid of the comment that Jerry wanted omitted.

Also, a recommendation from Ben Forde (Wasser rep) is included regarding acceptable methods of applying the urethane seal coating.

Pete can be ready to start fabrication on Thursday. Please advise.

Thank You,

Dan Bernard
CPM Constructors
P.O. Box B, 30 Bonney Street
Freeport, Maine 04032
Office: 207-865-0000
Cell: 207-841-2624
Fax: 207-865-4836
dbernard@cpmconstructors.com

OK to USE
JS Zoller
NHDOT Bridge Design
May 17, 2016

CPM Constructors

TRANSMITTAL
No. 00163

Phone: 2078650000

PROJECT: 20489 NHDOT Lebanon, NH-Hartford, VT

DATE: 5/17/2016

TO: New Hampshire DOT
John O. Morton Building
P.O. Box 483
Concord, NH 03302-0483

REF: Fletch's Metallizing Procedure
REV#3

ATTN: Jeffrey Potter

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
☐ Shop Drawings	☑ Approval	☐ Approved as Submitted
☐ Letter	☐ Your Use	☐ Approved as Noted
☐ Prints	☐ As Requested	☐ Returned After Loan
☐ Change Order	☐ Review and Comment	☑ Resubmit
☐ Plans		☐ Submit
☐ Samples	**SENT VIA:**	☐ Returned
☐ Specifications	☑ Attached	☐ Returned for Corrections
☑ Other: Metallizing Procedure	☐ Separate Cover Via:	☐ Due Date:

PACKAGE	SUBMITTAL REV.	ITEM NO.	COPIES	DATE	ITEM DESCRIPTION	STATUS
			1	5/17/2016	Fletch's Metallizing Procedure Revision #3 for the ACROW deck panels	NEW

Remarks: Pete performed mock bend tests on 10, 15, and 20 mil samples using a 1" mandrel. Some of the 15 and 20 mil tests resulted in some minor cracking, but no spalling or separation of the material from the base metal.

Ben Forde's comments were made after witnessing 2 different application methods @ Fletch's Sandblasting on 5/16/2016. The alternate option in Ben's letter visually was too thick and dripped as it was applied, so Fletch's will use

CC: Shaun Flynn, Jerry Zoller
Peter Krakoff, Jeff McGuire, Pete Nikolopoulos

Signed: _____
Dan Bernard

NH DEPARTMENT OF TRANSPORTATION
BUREAU OF BRIDGE DESIGN
JSZoller APPROVED DATE 5/17/2016

Fletch's Sandblasting and Painting, Inc.

Coatings Procedure for the NHDOT ACROW Bridge Deck Panels. Procedure 2-0570-TSC-Revision 2
Specified Coatings: TH604 Anti-Skid Metallizing with Sealer (3 pages + attachments noted at bottom)
Ref. Thermion Spraying Parameters Procedure and Product Data Sheet (PDS) using Thermion dual-arc spray equipment and CPM/Fletch's F.E. Purchase Order No. 17, as amended.

Start of Procedure

1. Visually check components to ensure that all sharp edges and corners have been eased and broken as supplied by CPM.

2. Fabricator to ensure that any thermally-hardened edges are removed prior to arrival at Fletch's so as to allow the steel surface to achieve the desired surface profile.

3. HOLD POINT.

4. An 18" x 18" x appropriate thickness Job Reference Standard (JRS) plate shall be prepared prior to production. The JRS plate shall be used as a Job Reference Standard as described in the SSPC-CS 23.00/AWS C2.23M/NACE No. 12 Joint Standard (henceforth referred to as "Joint Standard") and shall be prepared and used for demonstrating profile, metallizing thickness, adhesion tests, chisel tests, and appearance, as further qualified below.

   During production, prepare a 4" x 6" companion plate for each 500 square feet of production surface area not to exceed every 8th panel (Each panel surface is nominally 6' x 10', yielding 60 sq. ft.). Each companion plate will be used to check profile, perform chisel cut, thickness measurement and three (3) adhesion pulls for every companion plate.

   Specific test parameters will be as per the Joint Standard except as further qualified as follows:

   - Adhesion Test: The Adhesion test shall be performed using a calibrated manual adhesion tester (Manufacturer: DeFelsko, Model: PosiTest AT-M, Serial No.: AT08268). A minimum pull value of 1,000 psi. shall be deemed acceptable.
   - Chisel Test: The Chisel Test shall be performed in accordance with the Joint Standard except that the results will be observed and recorded as opposed to being subject to a pass/fail acceptance standard.
   - Bend Test: The 180 Degree Bend Test shall be performed as per the Joint Standard except that test coupons measuring 2" x 4"-8" x 22GA will be bent around a 1" diameter mandrel. The bend test will be performed using an Elcometer manual bend tester (Manufacturer: Elcometer, Model: US150, Serial No.: 150015030004). The test frequency will be five (5) test coupons per shift prepared at the start of each shift.

5. Prepare exposed, exterior top surfaces of steel of deck panels to an SSPC SP-5 White Metal Blast Clean using manual or automatic machine blasting resulting in a surface preparation as further described in step 6, below. The edges of the deck plates will not be subject to surface preparation or subsequent coatings except as incidental to processing of the top surfaces.

6. Steel surface profile shall be angular at 3-5 mils with a target value of 3.5 mils, using Maxi-Blast blast media with 30-60 grit size as manufactured by Bellemare (Product Data Sheets, attached). The profile shall be checked using Testex replicator tape and calibrated spring micrometer at a frequency of one (1) test per twenty (20) square feet as further described in the SSPC-CS 23.00/AWS C2.23M/NACE No. 12 Joint Standard. The angularity of the blasted surface shall be demonstrated by a Surface Comparator (See Step 7, below).

7. HOLD POINT: Inspect surface using a Surface Comparator (Elcometer 125 ISO 8503-1 Grit Blasted Surface Profile Comparator Disk). Blow down deck panel(s) with clean, compressed shop air immediately prior to metallizing. (NOTE: Fletch's uses electrically-driven air compressors, thus avoiding the risk of oil in the airline/airstream).

8. Apply TH604 metallized coating using a cross-hatch pattern to achieve an average target thickness of 15 mils, applied using the application procedure described per the Thermion Data Sheets, attached. Metallizing to be applied no later than 10 hours after surface preparation is completed. If surface demonstrates visible rust blooming within 10 hours or if more than 10 hours elapse after surface preparation, and prior to metallizing, plate shall be freshened using a brush blast as necessary to return to an SSPC SP-5 surface condition.

9. HOLD POINT

10. Environmental conditions shall be observed and recorded at 4 hour intervals to ensure environmental parameters are per the seal paint Product Data Sheets (PDSs) attached.

11. HOLD POINT

12. Wasser MC-Clear 100 urethane seal coating shall be roller or spray-applied as per the parameters specified in the manufacturer's Product Data Sheets (PDSs, attached) and the manufacturer's project-specific written procedure for one-coat application ("Wasser Procedure" dated 5-10-16, revised, attached). The coating may be applied using the "alternate" procedure, at Fletch's option, ("Wasser Procedure" dated 5-10-16, revised, attached).

13. Seal coating will be allowed will be allowed to dry overnight, no less than 8 hours, after which deck plates may be handled and stacked onto the transport trailer, or other intermediate location, with appropriate dunnage provided that doing so does not result in dunnage sticking to the sealer. Dunnage will consist of 2 x wood studs, double-stacked, or similar, sufficient to allow lift truck forks to pass beneath, nominally 3 inches, as provided by CPM.

14. HOLD POINT – FINAL INSPECTION.

End of Procedure

ATTACHMENTS: Bellemare Maxi-Blast Data Sheets – 18 pages (Includes COA Published in French)

Thermion TH604 Data Sheets – 3 pages

Wasser MC-Clear 100 Sealer Data Sheets – 4 pages

Wasser MC-Clear 100 Procedure and Recommendation Letter – 1 page

SAFTRAX™
a Thermion® Nonskid Product

TH604 is a ceramic oxide core wire composed of aluminum and up to 46% by volume of ceramic oxides. This is a "patented" process, which allows for a high percentage of ceramic within an aluminum matrix.

The purpose of this wire is to provide a wear resistant surface to aluminum, steel and stainless steel that is long lasting and protects against corrosion while maintainig an average coefficient of friction of 1.1.

USES:

- Anti-slip coatings for pedestrian traffic and personnel safety on boat decks, flooring, steps, ladders, walkways, scaffolding, etc. Particularly steel and aluminum substrates subject to corrosion.
- Anti-skid coatings for car/truck ramps, forklift loading ramps, aircraft landing areas, or any application requiring both nonskid and corrosion protection.
- To control corrosion, wear, abrasion, and impact. When applied to a steel substrate this material will provide corrosion protection and wear resistance properties. It provides equal corrosion protection as that of pure aluminum and wear resistance far superior to that of any material presently known to have both these unique properties. Application environment could include river flow, water slurry, wind blown sand, tidal flows etc.

APPLICATION:

This material was developed for cost effective production application. It is available and stocked in 1/8" (3.2mm) and can be made special ordered in 3/16" (4.8mm).

APPLICATION	Bond Strength	Coverage ft^2/lb	Coverage ft^2/hr
Anti-slip (aluminum)	2000 psi	14	350
Anti-slip (Steel)	2000 psi	8	240
Wear/Corrosion	2000 psi	5	140

- It is normally recommended to apply a sealer coat over a thermal sprayed coating that is applied to steel. The Anti-slip coating system will accept this sealer coating without degradation to the Anti-slip properties.
- The Ceramic Core material is applied with higher density to obtain the maximum wear for high surface contact areas.

5813 NE Minder Rd ☐Poulsbo, WA 98370 ☐Toll Free 877-884-3428 ☐ www.thermioninc.com

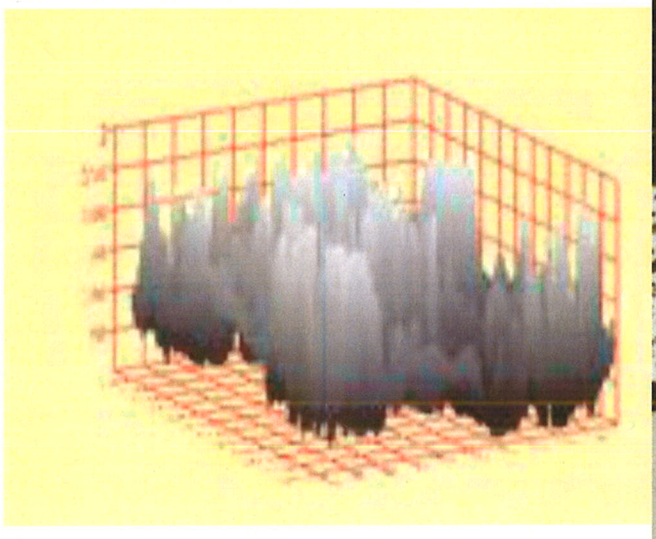
QUALITY ASSURANCE OFFICE
Laboratory Division

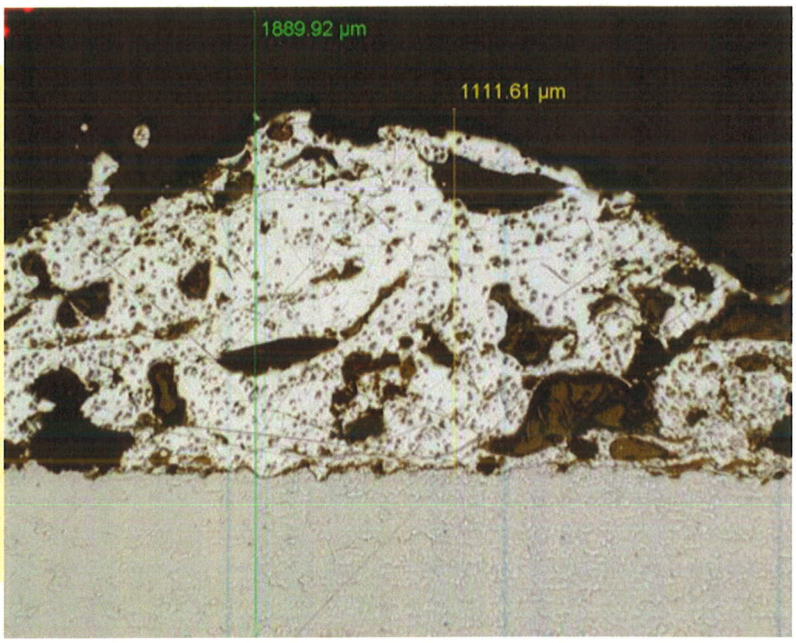
Specification: MIL-STD-1687/UIPI 0074-902

Number of Samples: 6

COATING TYPE: TH-604 CERAMIC CORE WIRE ON Cfe NON SKID WITH ARC WIRE PROCESS

TEST NUMBER: **TH604**





TENSILE TEST:

SAMPLE NUMBER	BREAKING LOAD LBS.	TENSILE STRENGHT PSI	FAILURE LOCATION
1	1359	1730	COATING
2	1707	2173	COATING
3	1391	1771	COATING
4	1431	1822	COATING
5	1961	2497	COATING
6	1920	2445	COATING
Average Coating:	1628 lbs.	2073 psi	100% Cohesive Failure
Standard Deviation:	271 lbs.	346 psi	

REQUIRED BOND: 1500 PSI MINIMUM AND 2000 PSI AVERAGE MINIMUM

Bend Test:
Bend Range: 180 degrees
Bend Radius: ¼ inch

5813 NE Minder Rd ☐Poulsbo, WA 98370 ☐Toll Free 877-884-3428 ☐ www.thermioninc.com

WASSER®
ADVANCED COATINGS TECHNOLOGY

May 10, 2016

Pete Nikolopoulos, MBA
Operations Manager
Excelerated Coatings, A Division of
Fletch's Sandblasting & Painting, Inc.
Granite State Trucking
52 Shirking Rd
Epping, NH 03042

Re: NHDOT Lebanon 14957 –Wasser MC-Clear 100 Metallizing Procedure

Mr. Nikolopoulos,

The following is the recommended procedure for use of the MC-Clear 100 over friction surfacing metalized surface;

- Thin MC-Clear 100, 20-30% and apply at 2.0-4.5 wft without the use of MC-Purquick accelerator. Let panels cure for a minimum of 8 hours before stacking.

Alternate system

- Thin MC-Clear 100, 20-30% and apply at 1.5-2.0 wft without the use of MC-Purquick accelerator. This enables the coating to have greater penetration into the metalized substrate and to allow for air entrapment to be released.
- Allow ½ hour for coating at 50 degree F to "flash off" allowing for majority of solvents to be release.
- Apply full coat of MC-Clear 100 at 2.5-3.4 wft (option to use MC-Purquick accelerator).
- Stacking of panels in 1 hour at 50 degree F with use of MC-Purquick accelerator, 8 hours without use of MC-Purquick accelerator.

MC-Clear 100 has better abrasion resistance than our MC-Metalizing sealer. MC-Clear has immersion capabilities that will enhance the performance of the high friction metalized surface.

Please let me know if you have any questions on the above procedures.

Sincerely,
Ben Forde
Director of Business Development
NE Technical Representative
Wasser Corporation
4118 B Place NW , Suite B
Auburn, WA 98001

MC-Clear 100

WASSER

Product Description

W271.0 6-7-2013

MC-Clear 100 is Wasser's clear, semi gloss and gloss-finishes, aesthetic topcoat. They provide excellent resistance to UV, weathering and abrasion in a moisture cure urethane coating. This topcoat selection has reliable, aliphatic urethane topcoat performance and its moisture cure properties allow for application in various service environments, on various project types, or substrates.

Area of Use

Substrates

Over properly prepared:
Ferrous Metal
Galvanized Metal
Aluminum/Non-Ferrous Metal
Concrete
Concrete Block

Possible Uses

Bridges
Tank Exteriors
Floors
Material Handling Equipment
Pulp and Paper Mills
Chemical Processing Facilities
Pipes
Hydropower Facilities
Water and Wastewater Treatment Facilities
Structural Steel
Food Processing
Work Boats
Refineries
Marine/Port Facilities
Offshore Platforms

Ready Reference Information

Resin Type: Aliphatic Urethane

Pigment Type: Clear

Sheen: Gloss and Semi Gloss

Colors: Clear

Volume Solids: 61.0% ± 2.0

VOC: <0.8 lb/gal (100 g/l)
(Volatile Organic Content)

Theoretical Coverage: @1 mil DFT: 978 ft^2/gal
(@ 25 µm DFT: 24.0 m^2/l)

Recommended Film Thickness
Wet: 1.6 - 3.3 mils (41 - 84 microns)
Dry: 1.0 - 2.0 mils (25 - 51 microns)

Recommended Coverage per coat:
489 ft^2/gal at 2.0 mils DFT - 978 ft^2/gal at 1.0 mils DFT
(12.0 m^2/l at 51 microns DFT - 24.0 m^2/l at 25 microns DFT)

Thinning: MC-Thinner, MC-Thinner 100, MC-Thinner XMT
Clean up: MC-Thinner, MC-Thinner 100, MC-Thinner XMT

Drying Times and Temperatures

*At 50% Humidity	50° F/10° C		75° F/24° C		95° F/35° C	
	without PURQuik®	*with PURQuik®*	without PURQuik®	*with PURQuik®*	without PURQuik®	*with PURQuik®*
Tack Free	48 hrs	4 hrs	3 hrs	40 min	1 hr 20 min	35 min
Recoat Minimum[1]	10 hrs	***1 hr***	8 hrs	***30 min***	6 hrs	***20 min***
Full Cure	10 days	***7 days***	7 days	***5 days***	5 days	***4 days***

Refer to Wasser's PURQuik® Accelerator Product Data for additional information

*Humidity, temperature and coating thickness will affect recoat and curing times

1. On clean surface, recoat within 24 hours. After 24 hours, do a test patch. Product may require light sanding to recoat.

Product Features

Single Component Moisture Cure Urethane
No Mixing Errors.
No Pot Life
Easy to apply by brush, roller or spray methods
Low VOC
UV, Impact, and Abrasion Resistant
Versatile clear topcoat for various substrates
Can be applied at 99% humidity
No Dew Point Restrictions (Substrate must be visibly dry)
Can be applied in below freezing temperatures (no ice or frost)
Compatible with PURQuik® Accelerator for faster recoat and cure times.

MC-Clear 100

Recommended Systems

Atmospheric Exposure

Ferrous Metals:

1st Coat: MC-Zinc 100	3.0-5.0 mils DFT
Or MC-Miozinc 100	
2nd Coat: MC-Ferrox B 100	3.0-5.0 mils DFT
3rd Coat: MC-Luster 100	2.0-4.0 mils DFT
Or MC-Ferrox A 100	
4th Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	9.5-16.0 mils DFT

1st Coat MC-Universal Primer DTM	4.0-5.5 mils DFT
2nd Coat: MC-Luster 100	2.0-4.0 mils DFT
Or MC-Ferrox A 100	
4th Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	7.5-11.5 mils DFT

Aluminum/Non-Ferrous Metals/ Galvanized Metal:

1st Coat: MC-CR 100	
Or MC-Universal Primer DTM	3.0-4.0 mils DFT
2nd Coat: MC-Shieldcoat 100	1.5-2.0 mils DFT
3rd Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	6.0-8.0 mils DFT

1st Coat: MC-Ferrox B 100	3.0-5.0 mils DFT
2nd Coat: MC-Luster 100	2.0-4.0 mils DFT
3rd Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	6.5-11.0 mils DFT

Concrete[1] (Interior/Exterior):

1st Coat: MC-CR 100	
Or MC-Universal Primer DTM	3.0-4.0 mils DFT
2nd Coat: MC-Luster 100	2.0-4.0 mils DFT
3rd Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	6.5-10.0 mils DFT

1st Coat: MC-Clear 100	1.5-2.0 mils DFT
2nd Coat: MC-Clear 100	1.5-2.0 mils DFT
Total System DFT:	3.0-4.0 mils DFT

1st Coat: MC-Clear 100	1.5-2.0 mils DFT
2nd Coat: MC-Antigraffiti 100	1.5-2.0 mils DFT
Total System DFT:	3.0-4.0 mils DFT

1. Prime coat for concrete may be reduced up to 25% to facilitate coating penetration. Subsequent coating applications may be reduced as necessary up to 10%. Thin in accordance with local and federal regulations.

Note: Use over recommended primers, intermediates, and topcoats for ferrous metal. MC-Clear 100 is not recommended for direct to ferrous metal applications.

***Other Systems are available and appropriate. Contact your Wasser Representative for any questions.**

Performance Testing Data

Dry Heat Resistance:
Continuous: 250°F (120°C)

*Contact Wasser High-Tech Coatings for detailed testing of this product

Compatible Coatings

Primer:

MC-Prepbond 100	MC-Prepbond 2.8
MC-Zinc 100	MC-Zinc 2.8
MC-Miozinc 100	MC-Miozinc 2.8

Intermediates:

MC-Ferrox B 100	MC-Ferrox B 2.8
MC-Miomastic 100	MC-Miomastic 2.8
MC-CR 100	

MC-Clear 100 as Finish Coat Over Topcoats:

MC-Ferrox A 100	MC-Ferrox A 2.8
MC-Luster 100	MC-Luster 2.8
MC-Shieldcoat 100	MC-Shieldcoat 2.8

MC-Clear100 is compatible with most Wasser/ Polyflex Membranes. Contact your Wasser Representative for any questions.

Coating Accelerator:
PURQuik® Coating Accelerator

W271.0 6-7-2013

Surface Preparation

Ferrous Metal

Apply to clean, dry, Wasser recommended primers. Refer to the primer Product Data for additional information.

Aluminum/Galvanized/Non-Ferrous Metal

Prepare surfaces using SSPC-SP1 Solvent Cleaning and SSPC-SP12/NACE No. 5 Low Pressure Water Cleaning methods to remove surface contamination. Supplement weathered galvanized surface preparation with SSPC-SP2 and 3 Hand and Power Tool Cleaning to remove excessive corrosion and impart surface profile on bare metal. Supplement new galvanized surface cleaning with mechanical abrasion to impart surface profile and support mechanical adhesion.

Concrete/Concrete Block

The surface must be dry, free of surface contaminants, and in sound condition. Grease, and oil should be removed by ASTM D4258-83 (Reapproved 1999) and release agents should be removed by ASTM D4259 - 88 (Reapproved 1999). Refer to SSPC-SP13/NACE No 6 mechanical or chemical surface preparation methods for preparing concrete to suitable cleanliness for intended service. Surface preparation methods should impart sufficient surface profile for mechanical adhesion to occur. Ensure surface is thoroughly rinsed and dry prior to coating application. Allow a minimum 7 - 14 days cure time for new concrete prior to preparation and application.

For 2 coat clear systems using MC-Antigraffiti 100 as the topcoat, use MC-Clear 100 for the prime coat

Good Practices

MC-Clear 100 is designed for application to a variety of substrates and coatings. Apply a test sample to a small area to determine coating adhesion and/or compatibility. Prime any areas cleaned to bare metal with a Wasser recommended primer and coating system.

The surface to be coated must be dry, clean, dull, and free from dirt, grease, oil, rust, mill scale, salts or any other surface contaminants that interfere with adhesion.

Ensure welds, repair areas, joints, and surface defects exposed by surface preparation are properly cleaned and treated prior to coating application.

Consult the referenced standards, SSPC-PA1 and your Wasser Representative for additional information or recommendations.

Application Information

MC-Clear 100 can be applied by brush, roll, airless spray and conventional spray methods. Follow proper mixing instructions before applying.

Mixing:

Material temperature must be 5° F above the dew point before opening and agitating.
Power mix thoroughly prior to application.
Do not keep under constant agitation.
Apply a 3-6 oz solvent float over material to prevent moisture intrusion and cover pail.

Brush/Roller:

Brush: Natural Fiber
Roller: Natural or synthetic fiber cover
Nap: ¼" to ⅜"
Core: Phenolic
Reduction: Typically not required. If necessary, reduce with MC-Thinner 100.

Airless Spray:

Pump Ratio:	28-40:1
Pressure:	2400-2800 psi
Hose:	¼" to ⅜"
Tip Size:	.007-.013
Filter Size:	60 mesh (250 µm)

Reduction: Typically not required. If necessary, reduce with MC-Thinner or MC-Thinner 100.

Conventional Spray: (DeVilbis MBC, JGA or equivalent)

Fluid Nozzle:	E Fluid Tip
Air Cap:	704 or 765
Atomizing Air:	45-75 lbs.
Fluid Pressure:	15-20 lbs.
Hose:	½" ID; 50' Max

Reduction: Typically not required. If necessary, reduce with MC-Thinner or MC-Thinner 100.

Reducer: MC-Thinner, MC-Thinner 100, (if VOC regulations restrict thinning, use MC-Thinner XMT). Reduction is typically not required. If necessary, thin up to 10% with recommended thinner. Thin in accordance with local and federal regulatory standards.

Clean up: MC-Thinner, MC-Thinner 100. If Wasser thinners are not available, use MEK, MIBK, Xylene, a 50:50 blend of Xylene and MEK or MIBK, or acetone for clean up only. Do not add unauthorized solvents to a Wasser coating.

Application Conditions:

Temperature: 20°-100° F (-8°-38°C)
This temperature range should be achieved for ambient, surface and material temperature. Substrate must be visibly dry. MC-Thinner 100 is recommended for spray application in temperatures above 90°F.

Relative Humidity: 6%-99%

Coating Accelerator: PURQuik® Accelerator. See Wasser's PURQuik® Accelerator Product Data for information.

Storage: Store off the ground in a dry, protected area in temperature between 40-100°F (4-38°C). MCU containers must be kept sealed when not in use. Use a solvent float to reseal partial containers.

MC-Clear 100

Certifications and Qualifications

W271.0 6-7-2013

VOC Compliant (National Standards – Industrial Maintenance Coating, and Concrete Protective Coating)
Qualified for use in USDA and FDA inspected facilities

Ordering Information

Product Numbers: W271.0SG (Semigloss)
W271.0 (Gloss)

Package Size: 1 and 5 gallon pails

Shelf Life: **12 months from date of shipment** when stored unopened at 75°F (24°C)

Shipping Information

Flash Point:	58.3°F (14.6°C)
Weight/gallon:	8.0 – 8.5 lbs/gal (0.95- 1.01 kg/l)
DOT HAZARD CLASS	3
DOT PACKAGING GROUP	II
DOT LABEL	FLAMMABLE LIQUID
DOT SHIPPING NAME	PAINT
DOT PLACARD	FLAMMABLE LIQUID
UN/NA NUMBER	1263

Safety Precautions

DANGER!

VAPOR AND SPRAY MIST HARMFUL. OVEREXPOSURE MAY CAUSE LUNG DAMAGE. MAY CAUSE ALLERGIC SKIN AND RESPIRATORY REACTION, EFFECTS MAY BE PERMANENT, MAY AFFECT THE BRAIN OR NERVOUS SYSTEM CAUSING DIZZINESS HEADACHE OR NAUSEA. CAUSES EYE, SKIN, NOSE AND THROAT IRRITATION. FLAMMABLE LIQUID AND VAPOR.

CONTAINS: Petroleum Distillates, Xylene, Ethylbenzene, Methyl-n-Amyl Ketone, Methyl Isobutyl Ketone, Isophorone Diisocyanate, Homopolymer HDI

NOTICE: Reports have associated repeated and prolonged occupational over-exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal. INDIVIDUALS WITH LUNG OR BREATHING PROBLEMS OR PRIOR REACTION TO ISOCYANATES MUST NOT BE EXPOSED TO VAPOR OR SPRAY MIST. **Use Only With Adequate Ventilation**. Do not breathe dust, vapors or spray mist. Ensure fresh air entry during application and drying. If you experience eye watering, headache or dizziness or if air monitoring demonstrates vapor/mist levels are above applicable limits, wear an appropriate, properly fitted respirator (NIOSH approved) during and after application. Follow respirator manufacturer's directions for respirator use. Do not get in eyes, on skin or on clothing. Wash thoroughly after handling. Keep away from heat, sparks and flame. Vapor may cause flash fire.

KEEP OUT OF REACH OF CHILDREN

FIRST AID: If affected by inhalation of vapor or spray mist, remove to fresh air. If breathing difficulty persists or occurs later, consult a physician and have label information available. In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If swallowed, get medical attention immediately. If swallowed, do not induce vomiting. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean or destroy contaminated shoes.

Keep container closed when not in use. If spilled, contain spilled material and remove with inert absorbent. Dispose of contaminated absorbent, container and unused contents in accordance with local, state and federal regulations.

WARNING: This product contains a chemical known to the state of California to cause cancer and birth defects, or other reproductive harm.

Obtain and Read the Material Safety Data Sheet Before Using.

INTENDED FOR PROFESSIONAL USE ONLY.

W271.0 and 271.0SG

Note: Ingredients and VOC/VOS may vary for products with catalysts, tint bases, and other colors

MC-PURQuik®

WASSER

Product Description

Revision Date 10/29/04

PURQuik® is a 100% solids proprietary additive formulated to accelerate the curing process of any Wasser Moisture Cure Urethane coating. This unique additive reduces recoat and overcoat times up to 80% and effectively reduces completion times even in temperature as low as 10°F (-12°C).

Product Features

- Compatible with all Wasser Single Component MCU Coatings
- 100% Solids
- Reduces recoat and overcoat times
- Accelerates coating reactivity in humidity as low as 6%
- Can be used in applications below freezing temperatures (no ice or frost)
- No adverse affects on coating performance
- Helps eliminate CO_2 bubbling typically caused by excessive coating film application
- Recommended for use in all service environments
- Increases volume solids in Wasser's 2.8 VOC series coatings from 62% to 64%

Drying Times and Temperatures

Temp		Primer MC-Zinc MC-Miozinc MC-Prepbond MC-Aluminum MC-MioAluminum Primer		Intermediate MC-Ferrox B MC-Miomastic MC-CR MC-Ferromastic		Topcoat MC-Luster MC-Ferrox A MC-Shieldcoat MC-Clear MC-Aroshield MC-Aroclear		Topcoat MC-Tar MC-BallastCoat	
° F	° C	without PURQuik®	***with PURQuik®***	without PURQuik®	***with PURQuik®***	without PURQuik®	***with PURQuik®***	without PURQuik®	***with PURQuik®***
10°	-12.2°	48 hours	***8 hours***	48 hours	***8 hours***	72 hours	***8 hours***	24 hours	***10 hours***
20°	-6.7°	24 hours	***3 hours***	24 hours	***3 hours***	48 hours	***3 hours***	18 hours	***4 hours***
30°	-1.1°	12 hours	***1.5 hours***	12 hours	***1.5 hours***	24 hours	***2 hours***	12 hours	***2 hours***
40°	4.4°	6 hours	***1 hours***	6 hours	***1 hours***	12 hours	***1 hours***	10 hours	***1 hours***
50°	10.0°	4-6 hours	***48 min***	6 hours	***48 min***	10 hours	***1 hours***	8 hours	***1 hours***
60°	15.6°	4-6 hours	***30 min***	6 hours	***36 min***	6-10 hours	***36 min***	6 hours	***36 min***
70°	21.1°	4-6 hours	***30 min***	6 hours	***30 min***	6-10 hours	***30 min***	4 hours	***30 min***
80°	26.7°	4-6 hours	***30 min***	4 hours	***30 min***	6-10 hours	***30 min***	4 hours	***30 min***
90°	32.2°	4-6 hours	***24 min***	4 hours	***30 min***	6-10 hours	***24 min***	4 hours	***30 min***
100°	37.8°	4-6 hours	***18 min***	4 hours	***18 min***	6-10 hours	***18 min***	2 hours	***18 min***

Dry times stated are approximate recoat times based on product application at average recommended film thickness and 60-90% RH. Actual dry times vary depending upon film thickness, ambient and substrate temperature.

Accelerating With PURQuik®

Add 1 quart can (32 oz fill) to each 5 gallon pail of Wasser's MCU coating.
Add 1 quart can (19.2 oz fill) to each 3 gallon pail of Wasser's MCU coating.
Add 1 half-pint can (6.4 oz] fill) to each 1 gallon pail of Wasser's MCU coating.

Once PURQuik® has been added to any Wasser MCU coating, there will be a pot-life. Accelerate only the materials that will be used the same day. To avoid premature gelling or shorter pot-life, use the following technique for addition:

Ensure the MCU coating has been brought to at least 5° F above the dew point. Open and agitate the coating as necessary to incorporate any settling or separation. Do not over-agitate. The pigmentation in Wasser's products ***will not settle*** once thoroughly incorporated. Add the pre-measured amount of PURQuik® to the thoroughly mixed coating and agitate only enough to incorporate the accelerator.

Immediately after PURQuik® has been combined with the coating, put a 3-6oz solvent float of Wasser's MC-Thinner or MC-Thinner 100 over the top of the coating in the container. Cover the container when possible.

Applying PURQuik® Accelerated Coatings

PURQuik® accelerated coatings are designed for spray application. Brush and roll applications are possible; however, the usable pot life may be drastically reduced when the accelerated coating is exposed to repeated dipping of brushes or mixing in the roller pan.

MC-PURQuik®

WASSER

Precautions When Using PURQuik®

Revision Date 10/29/04

CAUTION: All Wasser MCU coatings are tolerant of damp surface applications; however, using PURQuik® Accelerator will diminish the coating's ability to adhere to a damp surface.

Do not allow rain, water, or condensation to fall directly into the open container. Avoid excessive mixing or any action that will introduce atmospheric moisture into the accelerated coating. If PURQuik® and moisture have been combined with the coating, a very short pot life of 1 to 4 hours can occur.

Do not use PURQuik® in the first coat when applying Wasser's MCU coatings on concrete.

Consult a Wasser Representative if application in wet or freezing conditions is required. Special provisions must be made when temperature is below freezing and humidity is below 35%. Wasser requires a substrate that is free of frost or ice for application in temperatures below freezing.

Some slight variation in gloss levels may occur when PURQuik® is used in MCU coatings.

Avoid using accelerated material after 24 hours.

Ordering Information

Product Numbers:	W47.0
Package Size:	1 quart can (32oz fill) 1 quart can (19.2oz fill) 1 pint can (6.4oz fill)
Shelf Life:	**Not Applicable***

*Do not store coatings after PURQuik has been added.

Shipping Information

Flash Point:	170°F (76.6°C)
Weight/gallon:	7.16 lbs. (.86 kg/l)
DOT HAZARD CLASS	8
DOT PACKAGING GROUP	III
DOT LABEL	CORROSIVE
DOT SHIPPING NAME	AMINE, LIQUID, CORROSIVE, N.O.S. (BLOCKED DIAMINE)
DOT PLACARD	FLAMMABLE LIQUID
UN/NA NUMBER	2735

Safety Precautions

DANGER!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES EYE IRRITATION. CAUSES SKIN BURNS. HARMFUL IF SWALLOWED.

Caution: Corrosive

Vapor harmful. May affect the brain or nervous system causing dizziness, headache, or nausea. Causes nose, throat and lung irritation. **NOTICE**: Reports have associated repeated and prolonged occupational over-exposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal. Combustible liquid. Forms combustible mixtures with air at or above the flash point. Keep away from heat, sparks and flame. Vapor may cause flash fire. Do not smoke. Extinguish all flames and pilot lights, and turn off all stoves, heaters, electric motors and other sources of ignition during use and until all vapors are gone. Prevent build up of vapors by opening all windows and doors to achieve cross ventilation. **Use Only With Adequate Ventilation**. Do not breathe dust, vapors or spray mist. Ensure fresh air entry during application and drying. If you experience eye watering, headache or dizziness or if air monitoring demonstrates vapor/mist levels are above applicable limits, wear an appropriate, properly fitted respirator (NIOSH approved) during and after application. Follow respirator manufacturer's directions for respirator use. Do not get in eyes, on skin or clothing. Wash thoroughly after handling.

KEEP OUT OF REACH OF CHILDREN

FIRST AID: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. Get medical attention if irritation persists. If affected by inhalation of vapor or spray mist, remove to fresh air. If necessary, restore breathing and get medical attention immediately. If swallowed, do not induce vomiting. Get medical attention immediately. Remove contaminated clothing and shoes. Thoroughly clean or destroy contaminated clothing or shoes before reuse.

Keep container closed when not in use. If spilled, prevent bodily contact. Contain spilled material and remove with inert absorbent. Dispose of contaminated absorbent, container and unused contents in accordance with local, state and federal regulations.

Obtain and Read the Material Safety Data Sheet Before Using.

INTENDED FOR PROFESSIONAL USE ONLY.

W47.0

Note: Ingredients and VOC/VOS may vary for products with catalysts, tint bases, and other colors

MAXIBLAST

IRON SILICATE /// SILICATE DE FER

35/70 - EXTRA FIN/FINE

1.0 -2.0 MILS*
⅛" NOZZLE

USAGE

Enlever la rouille légère
Enlever la peinture écaillée

Light rust removal
Light coatings removal

30/60 - FIN/FINE

2.0 -3.5 MILS
⅛" NOZZLE

USAGE

Nettoyage de surfaces rouillées
Enlever la peinture
Métal à Blanc

Rust surface cleaning
Light coatings removal
White blast

20/40 - MEDIUM

3.5 - 4.5 MILS
3⁄16" NOZZLE

USAGE

Retirer la rouille forte
Enlever la calamine
Métal à blanc ou quasi à blanc

Heavy rust removal
Mill scale removal
White to near white blast

12/40 - GROSSIER/COARSE

4.5 - 6 MILS
¼" NOZZLE

USAGE

Retirer la rouille forte
Enlever la calamine épaisse
Enlever la peinture épaisse
Métal quasi à blanc

Heavy rust removal
Heavy mill scale removal
Heavy coatings removal
Near white blast

Disponible en palettes de 63 sacs de 22,7 kg (50 lb) ou super sacs de 1,4 T/M (3080 lb) ou en vrac
Available in pallet with 63 bags of 50 lb (22,7 kg) or 3080 lb (1400 kg) super bags or bulk

*Les informations ci-haut peuvent varier en fonction de plusieurs éléments tels que la pression à la buse, la distance entre la buse et la surface, la grosseur de la buse, la surface à sabrer, etc. Bellemare ne peut garantir que vous obtiendrez des résultats identiques avec le MAXIBLAST.
Pour de plus amples renseignements, veuillez vous référer à un représentant des ventes.
The above information may vary due to several factors such as pressure at the nozzle, nozzle to surface distance, nozzle size, type of surface, etc. Bellemare cannot guarantee identical profile results with MAXIBLAST. For more information, please contact our sales representative.

ABRASIFS & MINÉRAUX /// ABRASIVES & MINERALS

1866 885 4366

groupebellemare.com

APPENDIX F

FSP Daily Coating Inspection Reports (Panels 148-159)

Paint Inspection:

Daily Coating Inspection Report

Date: 8/9/16 M T W Th F S Su | Pg. 1 Of 1

Project #: 2-0570

Inspector: C. Fletcher

COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM / NHDOT

Location: Shop

Description: Steel Panels

Requirements: QP-3

Contractor:

Spec #

Revision #

Description of Areas & Work Performed

Blast Panels To SP-5

7 Panels

#S 148, 149, 150, 151, 152, 153, 154

Hold Point Inspections Performed

- ☑ 1 Pre Surface Pep/Condition & Cleanliness
- ☑ 2 Surface Preparation Monitoring
- ☑ 3 Post Surface Preparation/Cleanliness & Profile
- ☐ 4 Pre Application Prep/Surface Cleanliness
- ☐ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6 Post Application/Application Defects
- ☐ 7 Post Cure/Dry Film Thickness (DFT)
- ☐ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: CP

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure_____

☑ Steel ☑ Galvanize ☐ Concrete ☐ Other_____

☐ Hazard _____ ☐ Sample Report # _____

☑ Degree of contamination: N/A

Test: ☐ Cl_____ µg/cm² / ppm ☐ Fe _____ppm ☐ pH _____

☑ Degree of Corrosion: Rust Grade B

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other_____

☑ Painted Surface Condition: N/A

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: 6:45 Finish Time: 2:00 Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI_____ ☐ Other _____

☑ Abrasive Blast ☑ Abrasive Type 35-70 ☐ Sample

☑ Blast Hose Size 1¼" ☑ Nozzle Size / PSI 3/8-100

☑ Air Supply CFM 500 ☑ Air Supply Cleanliness

☑ Water/Oil Trap Check ☑ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☑ Job Specification ☑ SSPC/NACE - SP- 5

☑ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: Yes ☐ Disc ☑ Tape ☑ Gauge

☐ Specified _____ mils avg. / Achieved _____ mils

☐ Surface effect on DFT Gauge/BMR _____ mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	6:45	10:45	2:00	:
Dry Bulb Temp° (C/F)	66.1 °	76.3 °	85.8 °	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	75.4 %	45.9 %	32.5%	%
Surface Temp° (C/F) Min/Max	65/7 °	76 A °	86/3 °	/ °
Dew Point Temp° (C/F)	58.1 °	53.6 °	52.7 °	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time : Finish Time : Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type: Qty Mixed:

Manuf.: Mix Ratio:

Prod Name: Mix Method:

Prod #: Strain/Screen:

Color: Material Temp: °F

Kit Sz/Cond.: Sweat-in Time: Min/Hrs

Shelf Life: Pot Life: Min/Hrs

Batch #'s

(A) Reducer #:

(B) Qty Added: Pt/Qt/Gal

(C) % by Vol: %

Reducer: Specified WFT Avg: Mils

Achieved WFT Avg: Mils

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

Inspector's Signature

8-9-16

Date

SSPC the society for protective coatings

Fletch's Sandblasting & Painting Inc.
Industrial & Commercial Surface Preparation & Coating Specialists
52 Shirking Road Epping, NH 03042
(603) 679-3400

Surface Profile Record

Job : 2-0570	Job Name. : CPM / NH DOT	Date 8-9-16
Personnel	Inspector C. Fletcher	Sheet 1 of 1
Specifications attached	Yes No	

Area	Profile Reading
#148	Testex PRESS-O-FILM™ HT X-Coarse 4.0

Area	Profile Reading
#149	Testex PRESS-O-FILM™ HT X-Coarse 5.0

Area	Profile Reading
#148	Testex PRESS-O-FILM™ HT X-Coarse 4.3

Area	Profile Reading
#149	Testex PRESS-O-FILM™ HT X-Coarse 4.9

Area	Profile Reading
#148	Testex PRESS-O-FILM™ HT X-Coarse 4.3

Area	Profile Reading
#149	Testex PRESS-O-FILM™ HT X-Coarse 5.0

Area	Profile Reading
#150	Testex PRESS-O-FILM™ HT X-Coarse 4.6

Area	Profile Reading
#150	Testex PRESS-O-FILM™ HT X-Coarse 4.5

NOTES: #150

Testex PRESS-O-FILM™ HT X-Coarse 4.4

Testex PRESS-O-FILM™ www.testextape.com — X-Coarse — 1.5 to 4.5 mil — 38 to 115 µm — Made in USA — C — (C+XC)/2 — XC — 20 — 38 — 64 — 115 µm — 0.8 — 1.5 — 2.5 — 4.5 mil

Fletch's Sandblasting & Painting Inc.
Industrial & Commercial Surface Preparation & Coating Specialists
52 Shirking Road Epping, NH 03042
(603) 679-3400

Surface Profile Record

Job : 2-0570	Job Name. : CPM / NH DOT	Date 8-9-16
Personnel	Inspector C. Fletcher	Sheet 1 of 1
Specifications attached	Yes No	

Area	Profile Reading
#151	Testex PRESS-O-FILM™ HT, www.testextape.com, 5.1, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#152	Testex PRESS-O-FILM™ HT, www.testextape.com, 4.9, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#151	Testex PRESS-O-FILM™ HT, www.testextape.com, 5.0, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#152	Testex PRESS-O-FILM™ HT, www.testextape.com, 4.8, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#151	Testex PRESS-O-FILM™ HT, www.testextape.com, 5.0, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#152	Testex PRESS-O-FILM™ HT, www.testextape.com, 4.6, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#153	Testex PRESS-O-FILM™ HT, www.testextape.com, 4.4, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Area	Profile Reading
#153	Testex PRESS-O-FILM™ HT, www.testextape.com, 4.7, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

NOTES: #153

Testex PRESS-O-FILM™ HT, www.testextape.com, 4.8, X-Coarse, 1.5 to 4.5 mil, 38 to 115 µm, Made in USA

Fletch's Sandblasting & Painting Inc.
Industrial & Commercial Surface Preparation & Coating Specialists
52 Shirking Road Epping, NH 03042
(603) 679-3400

Surface Profile Record

Job : 2-0570	Job Name. : CPM / NH DOT		Date 8-9-16
Personnel	Inspector C. Fletcher		Sheet 1 of 1
Specifications attached	Yes No		

Area	Profile Reading
#154	Testex PRESS-O-FILM™ HT www.testextape.com 4.6 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 20 C 38 (C+XC) / 2 64 XC 0.8 1.5 2.5 4.5 mil

Area	Profile Reading

Area	Profile Reading
#154	Testex PRESS-O-FILM™ HT www.testextape.com 5.1 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 20 C 38 (C+XC) / 2 64 XC 0.8 1.5 2.5 4.5 mil

Area	Profile Reading

Area	Profile Reading
#154	Testex PRESS-O-FILM™ HT www.testextape.com 5.0 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 20 C 38 (C+XC) / 2 64 XC 0.8 1.5 2.5 4.5 mil

Area	Profile Reading

Area	Profile Reading

Area	Profile Reading

NOTES:

Paint Inspection:

Daily Coating Inspection Report

Date: 8 /9 /16 M T W Th F S Su | Pg. Of

Project #: 2-0570 | COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Inspector: C. Fletcher | Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM / NHDOT

Location: Shop

Description: Steel Panels

Requirements: QP-3

Contractor:

Spec # | Revision #

Description of Areas & Work Performed

Apply TH604 at a thickness no less than 15 mills

7 Panels

#'s 148, 149, 150, 151, 152, 153, 154

Hold Point Inspections Performed

- ☐ 1 Pre Surface Pep/Condition & Cleanliness
- ☐ 2 Surface Preparation Monitoring
- ☐ 3 Post Surface Preparation/Cleanliness & Profile
- ☑ 4 Pre Application Prep/Surface Cleanliness
- ☑ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☑ 6 Post Application/Application Defects
- ☑ 7 Post Cure/Dry Film Thickness (DFT)
- ☑ 8 Nonconformance/Corrective Actions Follow-up
- ☑ 9 Final Inspection

Approved By: CF

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure _____

☐ Steel ☐ Galvanize ☐ Concrete ☐ Other _____

☐ Hazard _____ ☐ Sample Report # _____

☐ Degree of contamination: _____

Test: ☐ Cl _____ µg/cm² / ppm ☐ Fe _____ ppm ☐ pH _____

☐ Degree of Corrosion: _____

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other _____

☐ Painted Surface Condition: _____

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI _____ ☐ Other _____

☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample

☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____

☐ Air Supply CFM _____ ☐ Air Supply Cleanliness

☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP _____

☐ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge

☐ Specified _____ mils avg. / Achieved _____ mils

☐ Surface effect on DFT Gauge/BMR _____ mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	7:45	11:45	3:00	:
Dry Bulb Temp° (C/F)	68.9°	78.4°	87.2°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	70.0 %	39.7 %	31.6 %	%
Surface Temp° (C/F) Min/Max	68/8°	79/1°	88/0°	/ °
Dew Point Temp° (C/F)	58.1°	53.4°	51.8°	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time 7:45 Finish Time 3:00 Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type: Ceramic/Alum

Manuf.: Thermion

Prod Name: Saftrax

Prod #: TH604

Color:

Kit Sz/Cond.:

Shelf Life:

Qty Mixed:

Mix Ratio:

Mix Method:

Strain/Screen:

Material Temp: °F

Sweat-in Time: Min/Hrs

Pot Life: Min/Hrs

Reducer #:

Qty Added: Pt/Qt/Gal

% by Vol: %

Specified WFT Avg: Mils

Achieved WFT Avg: Mils

Batch #'s

(A) [illegible]

(B)

(C)

Reducer:

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

CM Fletcher — Inspector's Signature

8-9-16 — Date

SSPC the society for protective coatings

Paint Inspection:

Daily Coating Inspection Report

Date: 8/9/16 M T W Th F S Su | Pg. 1 Of 1

Project #: 2-0570 | COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Inspector: C. Fletcher | Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM/NHDOT

Location: Shop

Description: Steel

Requirements: QP-3

Contractor:

Spec # | Revision #

Description of Areas & Work Performed

Apply one coat of Wasser MC-Clear 100 at 1.5 mills

#148, 149, 150, 151, 152, 153, 154

Hold Point Inspections Performed

- ☐ 1 ~~Pre Surface Pep/Condition & Cleanliness~~
- ☐ 2 ~~Surface Preparation Monitoring~~
- ☐ 3 ~~Post Surface Preparation/Cleanliness & Profile~~
- ☑ 4 Pre Application Prep/Surface Cleanliness
- ☑ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☑ 6 Post Application/Application Defects
- ☑ 7 Post Cure/Dry Film Thickness (DFT)
- ☑ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: CF

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure _____

☐ Steel ☐ Galvanize ☐ Concrete ☐ Other _____

☐ Hazard _____ ☐ Sample Report # _____

☐ Degree of contamination: _____

Test: ☐ Cl _____ µg/cm² / ppm ☐ Fe _____ ppm ☐ pH _____

☐ Degree of Corrosion: _____

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other _____

☐ Painted Surface Condition: _____

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI _____ ☐ Other _____

☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample

☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____

☐ Air Supply CFM _____ ☐ Air Supply Cleanliness

☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP _____

☐ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge

☐ Specified _____ mils avg. / Achieved _____ mils

☐ Surface effect on DFT Gauge/BMR _____ mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	3:00	:	:	:
Dry Bulb Temp° (C/F)	87.2°	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	31.6 %	%	%	%
Surface Temp° (C/F) Min/Max	88°	/ °	/ °	/ °
Dew Point Temp° (C/F)	51.8°	°	°	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time 3:00 Finish Time 3:15 Est. Sq/ft.

☐ Primer ☐ Intermediate ☑ Topcoat ☐ Touch-up

Generic Type: Urethane

Manuf.: Wasser

Prod Name: MC-Clear

Prod #: 100

Color: Clear

Kit Sz/Cond.: 1 GAL

Shelf Life: 12 mo.

Qty Mixed:

Mix Ratio:

Mix Method: Stick

Strain/Screen: Screen

Material Temp: °F

Sweat-in Time: N/A Min/Hrs

Pot Life: N/A Min/Hrs

Reducer #: 100

Qty Added: 20% Pt/Qt/Gal

% by Vol: 49% %

Specified WFT Avg: Mils

Achieved WFT Avg: Mils

Batch #'s

(A) 1605194

(B)

(C)

Reducer:

☑ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot Binks | Hose Dia. 1/4" | Air Check ✓

Ratio/Size 2.8 GAL | Hose Lng. 25' | SEP/Trap ✓

GPM/CFM 90 | Spray Gun Binks | Filter ✓

PSI 15 | Tip Sz. 68SS | Agitator N/A

C Fletcher 3-9-16

Inspector's Signature Date

SSPC the society for protective coatings

Paint Inspection:

Daily Coating Inspection Report

Date: 8/12/16 M T W Th (F) S Su | Pg. 1 Of 1

Project #: 2-0570 | COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Inspector: C. Fletcher | Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM / NHDOT

Location: Shop

Description: Steel Panels

Requirements: QP-3

Contractor:

Spec # | Revision #

Description of Areas & Work Performed

Blast Panels To SP-5

5 Panels

#'s 155, 156, 157, 158, 159

Hold Point Inspections Performed

- ☑ 1 Pre Surface Pep/Condition & Cleanliness
- ☑ 2 Surface Preparation Monitoring
- ☑ 3 Post Surface Preparation/Cleanliness & Profile
- ☐ 4 Pre Application Prep/Surface Cleanliness
- ☐ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6 Post Application/Application Defects
- ☐ 7 Post Cure/Dry Film Thickness (DFT)
- ☐ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: CF

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure_____

☑ Steel ☑ Galvanize ☐ Concrete ☐ Other_____

☐ Hazard _____ ☐ Sample Report # _____

☑ Degree of contamination: N/A

Test: ☐ Cl_____ µg/cm² / ppm ☐ Fe _____ppm ☐ pH _____

☑ Degree of Corrosion: Rust Grade B

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other_____

☑ Painted Surface Condition: N/A

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: 7:45 Finish Time: 2:00 Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI_____ ☐ Other _____

☑ Abrasive Blast ☑ Abrasive Type 35-70 ☐ Sample

☑ Blast Hose Size 1¼" ☑ Nozzle Size / PSI 3/8-100

☑ Air Supply CFM 500 ☑ Air Supply Cleanliness

☑ Water/Oil Trap Check ☑ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☑ Job Specification ☑ SSPC/NACE - SP- 5

☑ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: Yes ☐ Disc ☑ Tape ☑ Gauge

☐ Specified_____mils avg. / Achieved _____mils

☐ Surface effect on DFT Gauge/BMR_____mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	7:45	11:45	2:00	:
Dry Bulb Temp° (C/F)	79.2°	88.6°	94.1°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	82.1%	60.4%	50.9%	%
Surface Temp° (C/F) Min/Max	82/1°	89/3°	96/3°	/ °
Dew Point Temp° (C/F)	75.2°	74.6	73.1	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time : Finish Time : Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type: | Qty Mixed:

Manuf.: | Mix Ratio:

Prod Name: | Mix Method:

Prod #: | Strain/Screen:

Color: | Material Temp: °F

Kit Sz/Cond.: | Sweat-in Time: Min/Hrs

Shelf Life: | Pot Life: Min/Hrs

Batch #'s

(A) | Reducer #:

(B) | Qty Added: Pt/Qt/Gal

(C) | % by Vol: %

Reducer: | Specified WFT Avg: Mils

Achieved WFT Avg: Mils

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

CM Fletcher — 8-12-16

Inspector's Signature — Date

SSPC the society for protective coatings

Fletch's Sandblasting & Painting Inc.
Industrial & Commercial Surface Preparation & Coating Specialists
52 Shirking Road Epping, NH 03042
(603) 679-3400

Surface Profile Record

Job: 2-0570	Job Name.: CPM / NH DOT	Date 8-12-16
Personnel	Inspector C. Fletcher	Sheet 1 of 1
Specifications attached	Yes No	

Area	Profile Reading
#155	Testex PRESS-O-FILM™ HT www.testextape.com 4.6 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#156	Testex PRESS-O-FILM™ HT www.testextape.com 4.5 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#155	Testex PRESS-O-FILM™ HT www.testextape.com 4.4 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#156	Testex PRESS-O-FILM™ HT www.testextape.com 4.5 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#155	Testex PRESS-O-FILM™ HT www.testextape.com 4.3 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#156	Testex PRESS-O-FILM™ HT www.testextape.com 4.6 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#157	Testex PRESS-O-FILM™ HT www.testextape.com 4.3 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Area	Profile Reading
#157	Testex PRESS-O-FILM™ HT www.testextape.com 4.7 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

NOTES: #157

Testex PRESS-O-FILM™ HT www.testextape.com 4.2 X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 20 C 38 (C+XC)/2 64 XC 115 µm 0.8 1.5 2.5 4.5 mil

Fletch's Sandblasting & Painting Inc.
Industrial & Commercial Surface Preparation & Coating Specialists
52 Shirking Road Epping, NH 03042
(603) 679-3400

Surface Profile Record

Job: 2-0570	Job Name.: CPM / NH DOT		
Personnel	Inspector C. Fletcher	Date 8-12-16	
Specifications attached	Yes No	Sheet 1 of 1	

Area	Profile Reading
#158	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 4.4 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading
#159	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 4.6 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading
#158	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 4.0 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading
#159	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 4.2 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading
#158	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 5.0 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading
#159	Testex PRESS-O-FILM™ www.testextape.com HT X-Coarse 1.5 to 4.5 mil 38 to 115 µm Made in USA 115 µm 4.5 mil — 4.7 — 20 C 38 (C+XC)/2 64 XC — 0.8 1.5 2.5

Area	Profile Reading

Area	Profile Reading

NOTES:

Paint Inspection:

Daily Coating Inspection Report

Date: 8/12/16 M T W Th (F) S Su | Pg. 1 Of 1

Project #: 2-0570

Inspector: C. Fletcher

COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM / NHDOT

Location: Shop

Description: Steel Panels

Requirements: QP-3

Contractor:

Spec # | Revision #

Description of Areas & Work Performed

Apply TH604 at a thickness no less than 15 mills

Panels

#'s 155, 156, 157, 158, 159

Hold Point Inspections Performed

- ☐ 1 ~~Pre Surface Pep/Condition & Cleanliness~~
- ☐ 2 ~~Surface Preparation Monitoring~~
- ☐ 3 ~~Post Surface Preparation/Cleanliness & Profile~~
- ☑ 4 Pre Application Prep/Surface Cleanliness
- ☑ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☑ 6 Post Application/Application Defects
- ☑ 7 Post Cure/Dry Film Thickness (DFT)
- ☑ 8 Nonconformance/Corrective Actions Follow-up
- ☑ 9 Final Inspection

Approved By: CF

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure _____

☐ Steel ☐ Galvanize ☐ Concrete ☐ Other _____

☐ Hazard _____ ☐ Sample Report # _____

☐ Degree of contamination: _____

Test: ☐ Cl _____ µg/cm² / ppm ☐ Fe _____ ppm ☐ pH _____

☐ Degree of Corrosion: _____

☐ Scale ☒ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other _____

☐ Painted Surface Condition: _____

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI _____ ☐ Other _____

☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample

☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____

☐ Air Supply CFM _____ ☐ Air Supply Cleanliness

☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP _____

☐ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge

☐ Specified _____ mils avg. / Achieved _____ mils

☐ Surface effect on DFT Gauge/BMR _____ mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	10:00	2:00	3:00	:
Dry Bulb Temp° (C/F)	85.0°	94.3°	92.5°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	68.3%	50.6%	53.6 %	%
Surface Temp° (C/F) Min/Max	85/1 °	96/2 °	98/4 °	/ °
Dew Point Temp° (C/F)	73.5 °	73.1 °	72.7 °	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time: 10:00 Finish Time 3:00 Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type: Ceramic/Alum

Manuf.: Thermion

Prod Name: Saftrax

Prod #: TH604

Color:

Kit Sz/Cond.:

Shelf Life:

Qty Mixed:

Mix Ratio:

Mix Method:

Strain/Screen:

Material Temp: °F

Sweat-in Time: Min/Hrs

Pot Life: Min/Hrs

Reducer #:

Qty Added: Pt/Qt/Gal

% by Vol: %

Specified WFT Avg: Mils

Achieved WFT Avg: Mils

Batch #'s

(A)

(B)

(C)

Reducer:

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

C M F [illegible] 8-12-16

Inspector's Signature Date

SSPC the society for protective coatings

Paint Inspection:

Daily Coating Inspection Report

Date: 8/12/16 M T W Th (F) S Su | Pg. 1 Of 1

Project #: 2-0570 | COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Inspector: C. Fletcher | Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client: CPM/NHDOT

Location: Shop

Description: Steel

Requirements: QP-3

Contractor:

Spec # | Revision #

Description of Areas & Work Performed

Apply one coat of Wasser MC-Clear 100 at 1.5 mills

5 Panels

#'s 155, 156, 157, 158, 159

Hold Point Inspections Performed

- ☐ 1 Pre-Surface Pep/Condition & Cleanliness
- ☐ 2 Surface Preparation Monitoring
- ☐ 3 Post Surface Preparation/Cleanliness & Profile
- ☑ 4 Pre Application Prep/Surface Cleanliness
- ☑ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☑ 6 Post Application/Application Defects
- ☑ 7 Post Cure/Dry Film Thickness (DFT)
- ☑ 8 Nonconformance/Corrective Actions Follow-up
- ☑ 9 Final Inspection

Approved By: CF

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure _____

☐ Steel ☐ Galvanize ☐ Concrete ☐ Other _____

☐ Hazard _____ ☐ Sample Report # _____

☐ Degree of contamination: _____

Test: ☐ Cl _____ µg/cm² / ppm ☐ Fe _____ ppm ☐ pH _____

☐ Degree of Corrosion: _____

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other _____

☐ Painted Surface Condition: _____

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI _____ ☐ Other _____

☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample

☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____

☐ Air Supply CFM _____ ☐ Air Supply Cleanliness

☐ Water/Oil Trap Check ☐ Equipment Condition Check

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP _____

☐ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge

☐ Specified _____ mils avg. / Achieved _____ mils

☐ Surface effect on DFT Gauge/BMR _____ mils

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Ambient Conditions

Time (Indicate AM or PM)	3:00	:	:	:
Dry Bulb Temp° (C/F)	92.5 °	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	53.6 %	%	%	%
Surface Temp° (C/F) Min/Max	93/4 °	/ °	/ °	/ °
Dew Point Temp° (C/F)	72.7 °	°	°	°
Wind Direction/Speed				
Weather Conditions:				

Application

Start Time 3:00 Finish Time 3:15 Est. Sq/ft.

☐ Primer ☐ Intermediate ☑ Topcoat ☐ Touch-up

Generic Type: Urethane

Manuf.: Wasser

Prod Name: MC-Clear

Prod #: 100

Color: Clear

Kit Sz/Cond.: 1 GAL

Shelf Life: 12 mo.

Qty Mixed:

Mix Ratio:

Mix Method: Stick

Strain/Screen: Screen

Material Temp: °F

Sweat-in Time: N/A Min/Hrs

Pot Life: N/A Min/Hrs

Reducer #: 100

Qty Added: 20% Pt/Qt/Gal

% by Vol: 49% %

Specified WFT Avg: Mils

Achieved WFT Avg: Mils

Batch #'s

(A) 1605194

(B)

(C)

Reducer:

☑ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot Binks | Hose Dia. 1/4" | Air Check ✓

Ratio/Size 2.8 GAL | Hose Lng. 25' | SEP/Trap ✓

GPM/CFM 90 | Spray Gun Binks | Filter ✓

PSI 15 | Tip Sz. 68SS | Agitator N/A

Inspector's Signature | Date 8-12-16

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APPENDIX G

GPI Daily Inspection Reports (Panels 120-158)

GPI Greenman - Pedersen, Inc.

Engineering and Construction Services

New Hampshire Department Of Transportation

DAILY INSPECTION REPORT

This report shall not be reproduced without the written approval of the inspection company.
Inspection results relate only to the items inspected or tested.

Date 08/12/16 Day Friday Report # 160812KAG Piece # Panels 120 thru 158

District N/A Contract # 14957 Bridge # A000(627)

Project Lebanon, NH - Hartford, VT (Acrow Deck Panel Wearing Surface Restoration)

Inspector Kraig Gonyo Shift Start 1130 End 1430 Total Hrs 3.0

Description of Work Performed this Date:

1130 – Kraig Gonyo (GPI Representative) arrived at Fletchs'.

Coatings operations are being performed on this project today. Fletchs' is in the process of applying TSC to Deck Panels 155 - 158.

GPI Representative performed visual inspection on Deck Panels 134 thru 155 at Fletchs'. All Panels inspected have been metalized, and seal coated. Panels had a uniform appearance that was free of visible discontinuities.

Fletchs' QC Inspector, Curtis Fletcher allowed GPI Representative to measure dry film thickness (DFT) using Fletchs' DeFelsko Positector 6000 electronic DFT gage with FXS Extreme probe. GPI Representative verified calibration accuracy using plastic shims in accordance with SSPC-PA2. GPI Representative measured dry film thickness in accordance with NACE 12 (Joint Standard) on Deck Panel's 134 thru 157.
*Dry film thickness was measured in-process on Panels 156 and 157.

GPI Representative obtained and reviewed QC DFT reports for Deck Panels 120 thru 158. QC reports reflect conformance with Fletchs' approved TSC Procedure (Rev. 4).

GPI Representative inspected samples of bend tabs for dates 07/26/2016 thru 08/12/2016. At least (1) bend tab was visually inspected for each day of work. All bend tabs visually inspected were satisfactory in accordance with NACE 12 standard.

GPI Representative inspected all companion plates for dates 07/26/2016 thru 08/12/2016. All companion plates have had adhesion and cut tests performed. Cut tests were visually satisfactory in accordance with NACE 12 standard. Adhesion test results were recorded on each companion plate by Fletchs' QC using permanent marker. Companion plate test results recorded reflect conformance with Fletchs' approved TSC Procedure (Rev. 4). Companion Plate 08/12/2016 was tested today and GPI Representative witnessed testing.

Deck Panel No. 94 was previously reported as having seal coat sags. Curtis Fletcher informed that the panel was bristle blasted to remove the excess sealer. Curtis said that Fletchs' intended to save the panel for QA inspection prior to shipping but the panel was accidently loaded and shipped to the state shed. GPI Representative intends to make a trip to the NHDOT State Shed for inspection of Panel 094.

1430 – GPI Representative departed from Fletchs'.

Inspector Signature Kraig Gonyo Date 8/12/2016

QCS Review Date

181 Ballardvale Street, Suite 202, Wilmington, MA 01887 Tel: (978) 570-2999 Fax: (978) 658-3044
www.gpinet.com

GPI Greenman - Pedersen, Inc.

Engineering and Construction Services

Photo Log:

TSC Application In-Process

Companion Plates (Back Sides w/ Values Marked)

Comapnion Plates (Front Sides w/ Tests)

Bend Tabs Inspected

Stacked Deck Panels (Completed)

Completed TSC/Sealer

Photo Log:

Adhesion Test Result (08/12/2016 Companion Plate, Dollie No. 1)

Adhesion Test Result (08/12/2016 Companion Plate, Dollie No. 2)

Adhesion Test Result (08/12/2016 Companion Plate, Dollie No. 3)

APPENDIX H

NHDOT Bridge Deck Friction Treatment, University of New Hampshire (Haslett, 5/1/2017)

NHDOT Bridge Deck Friction Treatment

By

Katie Haslett

INDEPENDENT STUDY – CIE 795

FINAL REPORT

FACULTY ADVISOR:
DR. ESHAN V. DAVE, Ph.D.

05/01/2017

Introduction

Common application of high friction overlays are navy ship decks, military and commercial flight surfaces and marine structures. In recent years, Departments of Transportations (DOT's) are exploring the use of a high friction overlay for safety reason to decrease skid resistance and improve the durability of bridge decks. The New Hampshire DOT Bridge Deck Friction Treatment Study is focused on the evaluation of the skid resistance performance of a bridge deck panel coated with SafTraX TH604. The ceramic oxide thermal sprayed top coat as shown in Figure 1, creates an increased level of friction on the surface of the bridge deck to improve skid resistance, durability and resistance to corrosion.

Figure 1: Thermal spray top coat being applied to bridge deck panel.

The objective of the NHDOT Bridge Deck Friction Treatment study was to assess the bridge deck surface macrotexture and its frictional properties by accumulating base level characterization data. To achieve this goal two American Society of Testing and Materials (ASTM) tests were performed. The standard test for measuring pavement macrotexture depth using a volumetric technique (ASTM E965-15), and the standard test for measuring surface frictional properties using the British pendulum tester (ASTM E303-93) were conducted.

Methodology and Approach

Given the dimensions of the bridge deck, a systematic approach to determine the average surface texture as well as the skid resistance performance was developed. Figure 2, denotes the testing location dimensions on the 120-inch by 71.5-inch bridge deck panel. A total of eight testing locations were chosen that lie within the typical wheel path of vehicles assuming a car width of 72 inches.

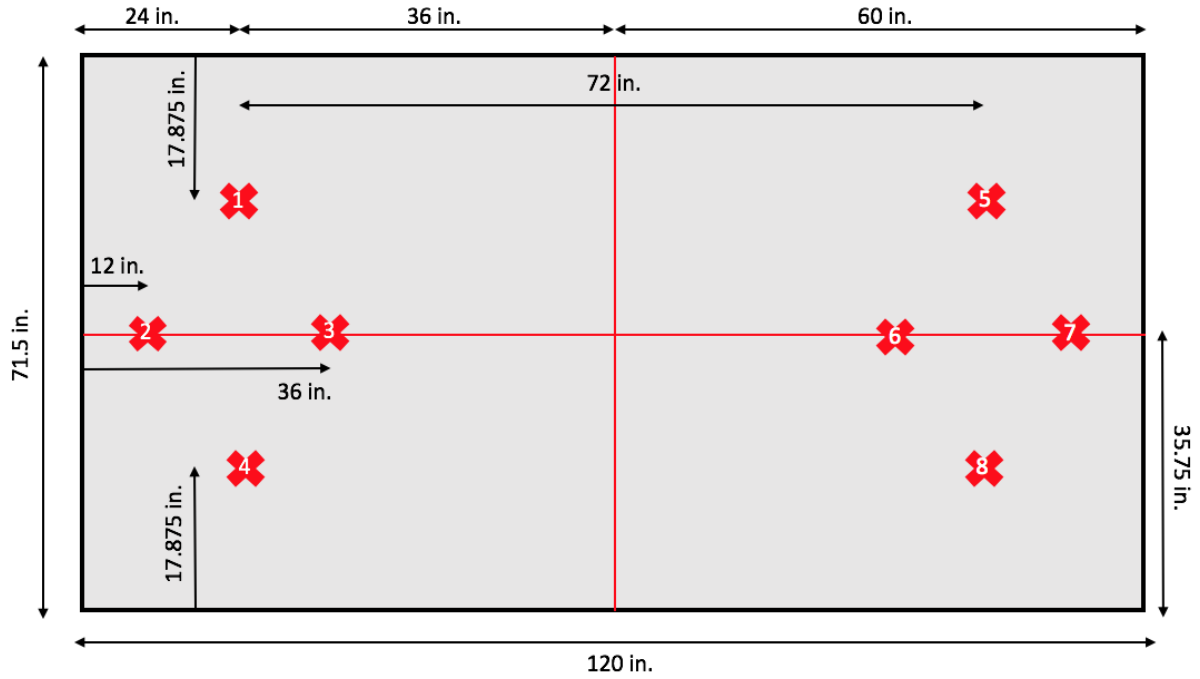

Figure 2: Bridge deck panel dimensions and testing locations.

Macrotexture Depth Testing

The adaptation of the standard testing method for pavement surfaces was used to determine the average depth of the bridge deck panel surface macrotexture. Given a known volume of material (Silica Sand), the macrotexture depth can be determined by spreading the materials and measuring the total area covered. The physical representation is the average depth between the bottom of the bridge deck surface voids and the top of the friction treatment overlay particles gives the macrotexture depth.

Testing was conducted in accordance with the ASTM E 965-15 standard. Upon spreading the silica sand in a circle on the surface of the bridge deck panel, four diameter measurements equally spaced around the circle were taken. The four measurements were then averaged to determine the average depth at each location. The Mean Texture Depth (mm) was calculated using Equation 1, where V was the sample volume (mm^3) and D was the average diameter of the area covered by the silica sand (mm).

$$MTD = \frac{4V}{\pi D^2} \qquad \text{(Eqn.1)}$$

The total MTD was calculated by averaging the MTD from the eight testing locations. Figure 3, shows the eight testing locations after performing the macrotexture test.

Figure 3: Post macrotexture depth testing.

British Pendulum Testing

Testing to determine the skid resistance of the bridge deck panel was performed in accordance with the ASTM E303-93 standard. As defined by the ASTM E303-93 standard, "The British Pendulum Tester is a dynamic pendulum impact-type tester used to measure the energy loss when a rubber slider edge is propelled over a test surface." The British pendulum measures British Pendulum (tester) Number (BPN) for each pass of the pendulum on the testing surface. The energy loss as the rubber slider passes the surface is used to determine the frictional properties of the bridge deck.

The testing procedure involved first cleaning the testing area of any debris. Next, a sufficient amount of water was applied to cover the test area thoroughly. One swing of the pendulum was executed but not recorded. Immediately after four more swings were executed, making sure to rewet the test area after each swing and the BPN value was recorded. Testing locations for the British pendulum test were the same as those used for the macrotexture depth testing. Three trials of testing were performed, where the order of testing location changed in an attempt to minimize the variability caused by wear of the rubber slides after repeated passes on the high friction surface. Table 1, summarizes the testing location order that was used for each trial.

Table 1: Summary of testing location order for 3 trials.

Testing Location Order		
Trial 1	**Trial 2**	**Trial 3**
1	8	3
2	7	4
3	6	5
4	5	6
5	4	7
6	3	8
7	2	1
8	1	2

Results and Conclusions

A summary of the average diameter and mean texture depth at the eight test locations is shown in Table 2. The total mean texture depth was determined to be 0.441 mm. Typical baseline MTD values for new asphalt, new brushed concrete and worn tined concrete are 0.409 mm, 0.749 mm and 0.350 mm respectively (Dave et al., 2015).

Table 2: Summary table of macrotexture depth testing.

Location	Average diameter (mm)	Test mean texture depth (mm)	Total mean texture depth (mm)
1	362.0	0.5092	0.441
2	406.4	0.3922	
3	393.7	0.4153	
4	381.0	0.4515	
5	390.5	0.4198	
6	381.0	0.4457	
7	387.4	0.4390	
8	374.7	0.4550	

The average British Pendulum Number (BPN) and standard deviation is reported for the eight test locations in Table 3.

Table 3: Summary table of British pendulum testing.

	Test Location							
	1	2	3	4	5	6	7	8
Average BPN	96	97	98	92	93	101	102	100
Std BPN	2.753	2.465	2.812	4.349	4.499	1.414	4.265	3.796

A higher BPN correlates to a higher energy loss caused by the drag of the rubber slider on the test surface. The British pendulum tester has BPN values ranging from 0 to 150. The total average BPN for the bridge deck was determined to be 97 BPN. No significant conclusions can be made about the skid resistance of the bridge deck panel using the BPN value alone. However, a NCHRP report focused on the characterization of concrete pavement stated that good antiskid micro-texture properties have BPN values ranging from 75-80. As expected, the total average BPN number of 97 for the bridge deck is slightly higher than typical treated concrete pavement surfaces due to the high friction treatment (Hall et al., 2008). To develop an greater understand of typical BPN values, the Michigan DOT found that the average BPN value for pavement markings with various combinations of paint and plastic beads ranged from 28-45 (Richard, 1975).

Both the mean texture depth and the average British pendulum number provide basic surface material characterization of the high friction treatment overlay on the bridge deck panel. It is recommended that similar testing as presenting in this study be conducted on the bridge deck after being installed for use in the field. Comparisons of values after being exposed to traffic and weathering in the field can be made to those from this study to evaluate the durability, resistance to corrosion and frictional resistance.

References

ASTM E303-93 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

ASTM E965-15 Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique.

Dave, Eshan V., Robert D. Kostick, Jay Dailey, and Lawrence M. Zanko. "Comparative Performance Study of Chip Seal and Bonded Wear Course Systems Applied to Bridge Decks and Approaches." Minnesota Department of Transportation. Draft Final Report. pp. 20-21. June. 2015. https://owl.english.purdue.edu/owl/resource/747/01/ Accessed 28 April, 2017.

Hall, J. W., K. L. Smith, and P. Littleton. "TEXTURING OF CONCRETE PAVEMENTS. "National Cooperative Highway Research Program, Transportation Research Board pp. A28. Applied Research Associates, Inc., 12 Nov. 2008. Accessed 01 May, 2017.

Richard, Charles L. "SKID TESTING OF PAVEMENT MARKINGS." TRAFFIC and SAFETY DIVISION (n.d.): n. pag. Michigan Department of State Highways and Transportation. December, 1975. https://www.michigan.gov/a/mdot/RR425TS_56_536797_7.pdf. Accessed 01 May, 2017.

APPENDIX I

Assessment of Bridge Deck Friction Treatment for NHDOT, University of New Hampshire (Haslett, Caron, Lamontagne, Dave, 2018-2019)

Assessment of Bridge Deck Friction Treatment for NHDOT

By

Katie Haslett, Eric Caron, Hilary Lamontagne and Eshan V. Dave
Department of Civil and Environmental Engineering
University of New Hapshire

Introduction

Common use of high friction overlays is to improve safety by increasing skid resistance during inclement weather conditions and as a side benefit they are also shown to improve the durability of bridge decks and pavement. In 2017, the New Hampshire Department of Transportation (NHDOT) decided to test a high-friction overlay on their Acrow 700XS temporary bridge panels. These panels are applied with SafTraX TH604 system. This ceramic oxide thermal sprayed coat system is expected to increased level of friction on the surface of the bridge deck to improve skid resistance, durability and resistance to corrosion.

The NHDOT worked with Eshan V. Dave (associate professor) at the University of New Hampshire (UNH) to assess the friction condition of SafTraX TH604 system and its degradation under vehicular and snow plowing conditions. The assessment was done through student independent study and a senior project for civil engineering undergraduate students.

The objective of this study was to assess the bridge deck surface macrotexture and its frictional properties prior to trafficking and post trafficking. To achieve this goal two type of tests were performed. The standard test for measuring pavement macrotexture depth using a volumetric technique (ASTM E965-15), and the standard test for measuring surface frictional properties using the British pendulum tester (ASTM E303-93) were conducted. The assessment also included selection of appropriate site for installation of the panels over a course of one winter season (December 2017 to April 2018) and measurement of macrotexture depth and friction properties at conclusion of this duration.

Testing Methodology and Approach

Given the dimensions of the bridge deck, a systematic approach to determine the average surface texture as well as the skid resistance performance was developed. Figure 1, denotes the testing location dimensions on the 120-inch by 71.5-inch bridge deck panel. A total of eight testing locations were chosen that lie within the typical wheel path of vehicles assuming a car width of 72 inches. A total of four panels were assessed in this study.

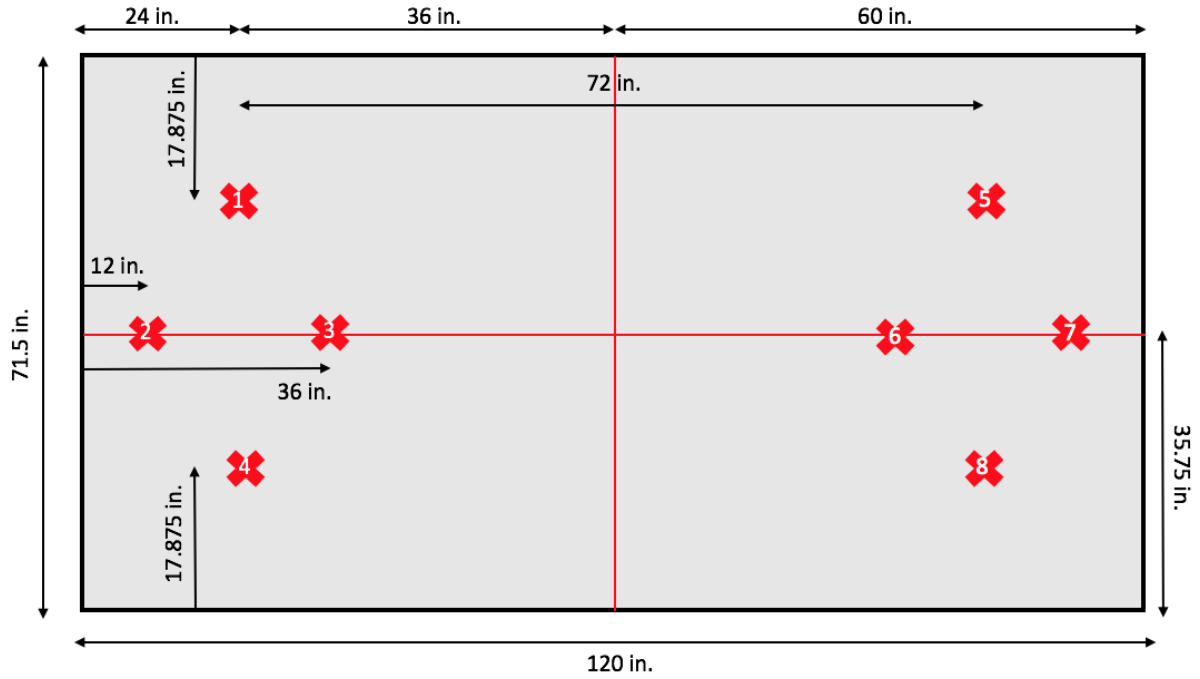

Figure 1: Bridge deck panel dimensions and testing locations.

Site Selection and Construction

After evaluating four potential locations around New Hampshire, the Newfields maintenance shed was selected for installation of panels. Various parameters such as, soil type, traffic volume, drainage conditions etc. were taken into account. Specifially, driveway for the Newfields shed was selected for installation purposes. Through structural analysis of panels and evaluation of the soil conditions, a structural support system was designed to hold the panels and provide similar deflection conditions to the panels as they would experience during their service within Acrow bridge system.

The site construction was monitored by the UNH students. After the concrete for support pads had cured the forms were removed. The trenches for the first half of the abutments were excavated and gravel was placed at the bottom of the trench. The crew also excavated a few inches in between the abutments to allow for deflection. Since the curbs were precast, phases I and II could be combined. After the first half of the abutments were placed in the trench, two panels were lowered onto the embedded j-hooks and secured with bolts. The NHDOT then backfilled the abutments with stone. For safety reasons during construction, barriers and guardrail was used over the bridge to prevent vehicles falling off. During this same construction step, the crew excavated the roadway for phase III. All the work at this point can be seen in Figure 2(a). Later, the crew returned to form and pour phase III. After the concrete had sufficiently cured the panels were added on the remaining part of the deck and secured. The guardrails were adjusted to accommodate the full bridge. The trenches were backfilled with stone similar to the first half of the site. NHDOT would

later return to asphalt patch the pavement that was cut out during the excavation. The final bridge, without the asphalt patches, can be seen in **Error! Reference source not found.** 2(b).

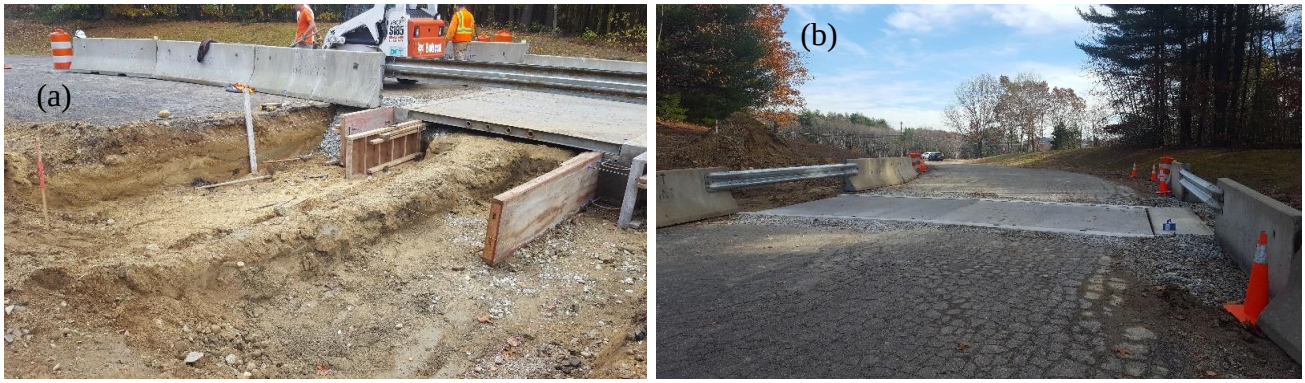

Figure 2: Construction of bridge at Newfields site for trafficking assessment of the high friction overlay system on Acrow bridge panel.

Trafficking

The test panels at the Newfields site were trafficked from their installation in November 2017 until their removal in May 2018. This site is used only by NHDOT employees and contractors working on behalf of NHDOT. The shed is also used by snow plowing crews for NHDOT. A trail camera was installed near the bridge structure to get estimate of the amount of traffic that has crossed the bridge structure. On basis of the number of times that the trail camera was activated by the vehicular traffic, it is estimated that between December 7th and April 8th (5 months) approximately 5,400 vehicles crossed this bridge. Approximately 10% of this traffic is expected to be that of snow plows. This approximation is on basis of review of a set of images form trail camera. A sample image taken by trail camera is sown in Figure 3.

Figure 3: Sample image from trail camera used to obtain estimate of traffic volume.

Results and Summary

A summary of the average micro-texture depth (MTD) for the four tested panels, average of eight test locations for each panel, is shown in Table 1. The total mean macro-texture depth was determined to be 0.46 mm. Typical baseline MTD values for new asphalt, new brushed concrete and worn tined concrete are 0.409 mm, 0.749 mm and 0.350 mm respectively (Dave et al., 2015).

Thus, the panels had an excellent MTD prior to trafficking and would have provided better skid resistance than new pavement surfaces. The results for the skid resistance measurement through British pendulum test are shown in Table 2. The British Pendulum Numbers for each of the four panel is in range of 110 to 116. These are very high compared to values typically seen on concrete or asphalt pavement surfaces. A NCHRP study focused on the characterization of concrete pavement stated that good antiskid micro-texture properties have BPN values ranging from 75-80 (Hall et al., 2008). Thus, prior to trafficking the high friction treatment was clearly providing excellent friction to the bridge deck panels.

Table 1: Summary table of macrotexture depth testing.

Macrotexture Depth [Sand Patch Test]			
Panel	Average Pre-Trafficking MTD (mm)	Average Post-Trafficking MTD (mm)	% Change (loss)
1	0.450	0.247	45.0
2	0.462	0.175	62.2
3	0.463	0.190	59.1
4	0.465	0.251	46.0

Table2: Summary table of British pendulum testing.

Microtexture [British Pendulum Test]			
Values in BPN (British Pendulum Number)			
Panel	Average Pre-Trafficking BPN	Average Post-Trafficking BPN	% Change (loss)
1	115.5	73	36.8
2	112.4	61	45.7
3	113.7	61.5	45.9
4	109.8	79	28.1
Note: A section of the overlay that was visibly removed by plowing during the study was tested and had an average BPN value of 44.			

Both Table 2 and 3 also show values of MTD and BPN post trafficking. After trafficking for five months both of these parameters degraded substantially. As discussed before, the MTD values have dropped to less than those for a worn concrete bridge deck surface. While MTD is not a direct measure of skid resistance it provides a good measure of the potential for hydroplaning of vehicles. The loss of BPN is also staggering. Figure 4 shows a panel after five months of trafficking and it can be clearly seen that there are several locations where the high friction treatment has completely been removed from the steel deck surface. BPN values in such exposure surface measured an average of 44. This is a quite low value that would typically prompt an immediate action to prevent vehicular crashes due to loss of skid resistance.

Figure 4: Bridge panels after trafficking showing abrasion and removal of high friction treatment.

In summary, the evaluation of four panels through use of macro-texture depth and British pendulum in conjunction with actual trafficking showed that while the SafeTraX treatment provided an excellent skid resistance prior to trafficking, under the action of snow plows and other vehicles the effectiveness of this system deteriorated substantially. Furthermore, the system was not able to stay adhered to the steel deck under the plowing action and resulted in complete removal at a number of locations. It should be noted that while an approximate number of 5,200 vehicles is not very high traffic level, an estimated number of 520 snow plowing actions is on a severe side for single winter season. On a highway bridge with medium traffic in New Hampshire, it would typically take 2 to 4 years for applying 500 snow plow repetitions to the deck surface.

References

ASTM E303-93 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.

ASTM E965-15 Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique.

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Hall, J. W., K. L. Smith, and P. Littleton. "TEXTURING OF CONCRETE PAVEMENTS. "National Cooperative Highway Research Program, Transportation Research Board pp. A28. Applied Research Associates, Inc., 12 Nov. 2008. Accessed 01 May, 2017.

APPENDIX J

NHDOT Bridge Design Evaluation of Thermion SafTrax TH604 Metallized Coating for Acrow Deck Panels (J. Zoller, 1/16/2020)

STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

DATE January 16, 2020

From Jerry S. Zoller, P.E.
Project Engineer

Office Bureau of Bridge Design
Tel. 603-271-2731

Subject **Lebanon NH – Hartford, VT 14957**
ACROW bridge deck panels
Evaluation of Thermion SafTrax TH604 metallized coating

To Ann M. Scholz, P.E., Research Engineer
NHDOT Bureau of Materials & Research

Re: M&R Research Report - Experimental Feature No. EF 2016-01

I have been involved with this research project throughout its duration related to the metallizing coating and was asked to comment on the M&R Final Report. Please consider my written comments, evaluations, and opinions, as follows.

I. Introduction

On the Lebanon-Hartford 14957 bridge replacement project, a State-owned ACROW temporary pony truss bridge was used to accommodate detoured traffic around the bridge construction site. The ACROW bridge uses 6-ft by 10-ft deck panels with a ¼-inch steel plate top surface. Over the course of the project, the bridge exhibited a need for an improved non-slip deck surface for the safety of the motoring public and longevity of the bridge.

The original galvanized surface was too slippery and was removed. The galvanizing was replaced by a thin tack-and-pavement coating which also performed poorly and was replaced after five months. A new 1/4-inch (min.) Poly-Carb Flexogrid overlay was then applied and remained for the rest of the project but performed below expectations. All three coatings proved to be inadequate for providing a non-slip, well-adhered, durable, corrosion-resistant surface on the deck panels.

After the new bridge was completed, the ACROW bridge was dismantled for storage. A better coating was needed for the 180+ deck panels. Bridge Design recommended a thermal spray coating (TSC), i.e. metallizing. The General Contractor inquired within the metallizing industry and Thermion (TSC manufacturer) recommended the SafTrax TH604 anti-skid product.

II. Objective

The objective of this Experimental Feature research project is to document the application and evaluate the performance of the Thermion SafTrax TH604 metallized coating as a nonskid, durable, well-adhered, corrosion-resistant wearing surface for ACROW bridge steel deck panels.

III. Product Description

Metallizing is not a new coating to NHDOT for steel bridges. The Department applied a 100% zinc TSC on the recently constructed Memorial Bridge in Portsmouth (2012), as well as other bridges in New Ipswich (2014), Londonderry (2016) and Alstead (2018).

What makes this research project experimental is the Thermion SafTrax TH604 metallized coating itself and where on the bridge it is to be used. The intended purpose of this coating is to be a wearing surface for traffic. All other structural coatings are applied to bridge members subject to the weather but not to direct traffic wear, as is the case of the deck panels. This TSC is also different in its composition. It is made of a ceramic oxide core within an aluminum matrix, which is unique for bridges (versus the commonly used 100% Zinc or 85%Zn/15%AL). The aluminum provides corrosion-resistance and adhesion, and the ceramic component provides wear-resistance and nonskid surface roughness. The US Navy has evaluated and used this product for extreme-durability nonskid use on Naval vessel flight decks for take-offs and landings. This product will be unique and experimental in its application on ACROW bridge deck panels. See Appendix C.

IV. Research Approach

The Department approved a change order for the General Contractor to remove the Poly-Carb Flexogrid coating from the deck panels and to apply the Thermion SafTrax TH604 TSC. The application work was performed by Excelerated Coatings, a division of Fletch's Sandblasting & Painting, Inc., at their Epping, NH facilities.

The Experimental Feature research project and funding were prepared by the Bureau of Materials & Research and approved by FHWA. The Bureau of Bridge Design provided specification requirements, approved Fletch's work plan (Appendix E), and furnished consultant Quality Assurance inspection through Greenman-Pedersen, Inc. (Appendix G).

The Bureau of Bridge Maintenance built a bridge-mockup at a NHDOT patrol shed in Newfields for field testing and evaluation of four deck panels subjected to actual truck traffic. The University of New Hampshire participated in the development of the field test site, as well as performed lab and field testing and

University of New Hampshire

evaluation (Appendices H & I). Bridge Design is providing additional comments and evaluation on the research report in this memo.

V. Product Application

The principal parties met at Fletch's to witness a demonstration of the metallizing of two ACROW deck panels, and to discuss associated issues and the Department's requirements. The follow-up application work plan was subsequently approved by Bridge Design [Appendix E]. The governing specification was the Joint Standard *SSPC-CS 23.00 /AWS C2.23 /NACE No. 12 Specification for the Application of Thermal Spray Coatings (Metallizing)… for the Corrosion Protection of Steel*.

The governing specifications and approved work plan called for 1) an SP5 White Metal hand-blast finish using metallic grit abrasive to produce a 3-5 mil angular profile; 2) 1,000 psi adhesion (min.); 3) 15 mil metallizing thickness (min.); 4) addition of a thin clear seal coat; and 5) QA inspection.

The Joint Standard spec requires destructive testing each day before production begins consisting of five metallized thin metal strips bent 180 degrees around a mandrel, and pull-off adhesion tests and a chisel test on a small metallized plate.

The Department delivered 185 ACROW deck panels to Fletch's for coating during the summer of 2016. The top steel surface of each panel was blast cleaned to SSPC-SP5 White Metal cleanliness using Maxiblast® iron-silicate 30/60 fine grit abrasive by Bellemare Group. The Thermion SafTrax 604TH TSC was applied to each panel as specified.

The Fletch's QC reports and GPI QA inspection reports (Appendices F, G) demonstrated that the work met or exceeded the requirements of the approved work plan and was acceptable.

- Average steel surface profile was 4.5 mils.
- Average thickness was 25.6 mils: (low 19.0, high 31.3)
- All bend specimens passed the 180-degree bend test.
- All companion plates passed the cut (chisel) test.
- Average adhesion was 2,958 psi: (low 1,906, high 5,032)

The actual adhesion values (psi) achieved are very high compared with standard metallizing wire (100% Zn and 85/15) used for bridge coating and with the US Navy requirements, as follows:

Metallizing Wire	Joint Standard	US Navy	ACROW panels	Adhesion Achieved (psi)
100% Zn	500 (min.)	---	---	---
85% Zn / 15% AL	700 (min.)	---	---	---
100% AL	1,000 (min.)	---	---	---
SafTrax TH604	---	1,500 (min.) 2,000 (ave.)	1,000 (min.)	1,906 (low) 2,957 (ave.) 5,032 (high)

VI. UNH Product Evaluations

The University of New Hampshire participated in this research project and issued three reports: 1) initial lab testing (Appendix H); 2) after installation of the Newfields test site (not included); and 3) after winter exposure and spring evaluation (Appendix I). [Note: deck panel 4 used in lab testing is the panel furthest to the right in the photo.]

Please consider my comments on the UNH report.

1. It should be noted that the two lab tests, a) the surface macro-texture depth measurement, and b) the British Pendulum friction test, apparently, are typically used in characterizing the friction/skid-resistance properties of wearing surfaces.

2. The report does not mention any correlation between the lab tests and the coating properties measured at the shop, (e.g. adhesion or coating thickness.)

<u>Surface macro-texture depth (MTD) measurement (sand patch)</u>

3. The surface macro-texture depth (MTD) measurement (sand patch) has some value by indicating that the pre-test value of 0.441 mm is higher and shows greater skid resistance than new asphalt (0.409 mm). This test also shows the relative change with before-and-after measurements that the TH604 surface roughness diminished after field testing.

4. In the first and last UNH reports the sand patch MTD depths were reported in mm, and in the intermediate report, in inches. Since the coating industry uses mil units (thousandth of an inch), the values show that the panel 4 lab depth was 17.7 mils (.441 mm) and the field-measured depth was 18.3 mils, both rounded to 18 mils.

5. The third report stated that the sand patch MTD depths decreased from 18 mils to 7-10 mils over the winter (Table 1). Although this is a large percentage loss (say 50%), which the

report characterizes as “degraded substantially”, I do not consider this a major problem. Let me explain.

6. Any metallized coating has surface roughness much greater than that of paint. The Thermion TH604 has exaggerated surface roughness to impart its skid-resistant properties. Below the surface roughness is the thickness of the coating itself, which in the case of the deck panels was specified to be 15 mils min. but was actually applied at an average 25 mils. One would expect that as a wearing surface the roughness peaks would wear down/off since they are sticking up. However, even if worn off, the full coating thickness still remains. From the UNH test, the sand patch MTD depth dropped from 18 mils (which is very high for a coating) down to 9 mils (which is still high for a coating). Yes, the worn surface has a lower roughness than before, but it is still significant.

7. Unfortunately, no coating thickness readings were made in the field to correlate before-and-after thickness changes.

8. Since the sand patch tests were done in the same locations for each panel, I’m wondering if any silica sand remained in the coating voids that might affect subsequent readings.

<u>British Pendulum friction test</u>

9. In my view the British Pendulum friction test appears to inherently be a valid test for measuring surface friction and slip resistance.

10. The UNH report indicated that the British Pendulum Test Value Number (BPN) as measured in the lab was 97 BPN, higher than that of concrete pavement with a value of 75-80 BPN, and thus indicating a very good surface friction and slip resistance.

11. Having said that, the UNH reports indicated that there are some variables that affect the values. For example, the test values in the field were significantly higher (110-115 BPN) than in the lab (97 BPN). The high BPN value indicates the surface has ‘superior friction characteristics’, as stated in the UNH report. It was suggested that temperature may have been a factor in the reduced consistency in test values between lab and field.

12. The reports also indicated that a new pad on the test apparatus measures significantly higher than after several uses (e.g. 127 vs 117 and 123 vs 113)).

13. The report also mentions that the surface must be clean and free of dirt and contaminants. For this reason, the researchers decided to wet the surface after sweeping. It is not clear how the wet condition might effect the test value.

14. The report indicates that the before-and-after BPN values dropped from an average value of 112.9 BPN down to and average 68.6 BPN. While this is a dramatic percentage decrease, the

resulting level of 69 BPN is just below the range of 75-80 for concrete characterized as having good anti-skid properties.

15. The UNH report of the field evaluation over emphasized those minor areas where the snow plow blades scraped the coating down to bare metal and used terminology (e.g. substantially degraded, loss is staggering, prompt immediate action, etc.) that might leave the wrong impression (in my view) to the reader. The UNH research did not address adhesion or corrosion protection.

VII. J. Zoller Product Evaluation

I visited the field test site in Newfields on August 13, 2018 to examine the four deck panels and take photos. My observations, evaluations, and opinions are noted as follows.

1. The first impression upon seeing the test site with four deck panels is that are areas scraped to bare metal. Otherwise, the other surfaces seem to be OK.

2. Upon closer examination, you notice that the bare metal areas are almost entirely located at the panel edges; some on panel 1 and more on panel 2 & 3 where they fit together.

3. A quick estimate (assuming 4-inch wide) by the length of the panel (10-ft.) indicates that the scraped areas combined are 1%-2% of the total surface area.

4. A close examination of the major scrape areas shows that in these locations the 1/4-inch top plate is wavy and that the scrape off areas correspond to the high point on the plate. In other words, the snow plow blades would consistently hit the high spots over and over.

5. If the UNH estimate of snow plows (10% of 5200 vehicles) is anywhere close, then this test site has been subjected to an amazing number of plow passes, quite a bit higher than any normal bridge, I'm guessing.

6. One also observes that there has been wear in the coating along distinct lines that correspond to the ribs in the panel supporting the top plate. These areas, too, are slightly higher than adjoining surfaces where plow blade contact would be concentrated.

7. One also observes, looking at the geometry of the site, that snow plows would naturally drive in the middle of the road, thus also concentrating impacts on the center panels.

8. Other than the obvious bare metal scrape spots, I did not observe any of what you might call wheel tracks worn on the panels.

9. I observed that the concrete abutments exhibited considerable spalling and damage from plow blade impacts, demonstrating the power of the 1,500+ pound plows to inflict damage.

10. A careful examination of the bare spots shows that the coating is extremely well adhered to the steel plate adjacent to where it has been mechanically scraped off. There is no disbonding of the coating, no lifting of adjacent edges, no delaminations or peeling of any kind.

11. I felt a number of coated areas with my hands while on my knees and most areas adjacent and away from the heavily scraped areas were rough to the touch.

12. Other than the areas worn to bare metal, I did not see any evidence of rust in the coating.

VIII. Summary & Conclusions

13. My recommendation is that the Department consider the Thermion TH604 coating a successful treatment for the ACROW bridge deck panels. The product is unique to the bridge industry having been adapted from Navy use, shows excellent anti-skid properties, extremely high adhesion, apparent good corrosion protection based the performance history of metallizing and a limited field test.

14. I believe exposure to snow plows is the most difficult test that can be applied, that there is some value in that, but that it is an unreasonable expectation that any coating can withstand without damage the violent scraping from a 3/4-ton metal blade moving 30 mph.

15. I appreciate and thank the University of New Hampshire for applying techniques from the highway industry to determine friction properties for wearing surfaces, and hope that the experience was of value to those UNH students who contributed time and effort.