

***Robust Functional Paperless Paint
Phase II***

Prepared for:

*National Shipbuilding Research Program
Surface Preparation and Coatings Panel (SPC)*

Submitted by:

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Executive Summary

The National Shipbuilding Research Program (NSRP) Surface Preparation and Coating (SPC) Panel completed this project to update the existing Robust Functional Paperless paint software system. Specifically, the project incorporated features which take advantage of paperless technology in the QA process by:

- Electronic event notification
- Auto-flag out of spec conditions
- Automate Non-Conformance reporting and resolution
- Quality control reports for contractor process improvement
- As-needed improvements to the data collection and reporting process

The commercially available system was originally developed for and successfully used by industrial coating contractors. NSRP sponsored an initial project to focus on adapting the user Interface and the functionality of the product so it would meet the needs of deck plate inspectors performing work on Navy ships in accordance with Navy Standard Item 009-32 for shipboard painting. This follow-on project focused on technological (connectivity/security) challenges associated with working on US Navy ships. These constraints include shipyard specific IT and security requirements as well as issues associated with providing the data to US Navy representatives in an acceptable format. In addition, the project developed a number of system improvements and updates unique to US Navy shipbuilding.

The project has succeeded in accomplishing three objectives:

- Expanded the user base familiar with the product as it may apply to US Navy Preservation QA/QC. Twenty-seven user accounts at 6 shipyards were established under this program.
- Actively engaged NAVSEA waterfront personnel in dialogue about the products use for Navy ship repair.
- Implemented software updates based on user feedback and updated to meet the most recent NAVSEA Standard Item 009-32 requirements.

Additional efforts are required to ensure successful implementation of the system for Navy Ship Repair. The software is now suitable for a pilot program in the southeast region. The Navy shipbuilding community will need to support continued system updates by the vendor to ensure that it remains current with NAVSEA Standard Item 009-32 requirements.

Acknowledgements

This project would not have been successful without the assistance of a number of people. A number of Navy and Industry representatives who have been involved with previous evolutions of paperless QA technology provided critical feedback to the project team. In particular, representatives from General Dynamics-NASSCO, Bath Iron Works, , BAE Systems Southeast Shipyards, HII-Ingalls Shipbuilding, Vigor Industrial, Surface Technologies, IMIA International Marine & Industrial Applicators, Southeast Regional Maintenance Center (SERMC), and Naval Sea Systems Command provided time and technical expertise throughout both project phases.

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Conclusions

1. There is still a strong desire for a paperless quality assurance system that can improve efficiency of surface preparation and coatings QA/QC during shipbuilding and ship repair. Independent studies suggest that significant cost savings (on the order of a million dollars a year) could be achieved with Navy-wide adoption of a paperless system. The need is not solely driven by the US Navy; shipyards desire a system for both military and commercial work.
2. The project has funded use of the system by twenty-seven users at six NSRP shipyards. NSRP shipyards and their subcontractors are using the system for commercial shipbuilding activities.
3. While the system can meet the requirements for electronically collecting surface preparation and coatings QA data, there are two issues which must be overcome:
 - a. NAVSEA does not accept electronic copies with electronic signatures. This has precluded shipyards from adopting the system for Navy ship repair. The TruQC system does deliver the Navy a “paper” (or .pdf) product which must be printed, signed and submitted to NAVSEA.
 - b. Submitting paper data in the format required by the Appendices of NAVSEA Standard Item (NSI) 009-32 will require annual software updates to address modifications instituted annually through the NAVSEA Standard Specification for Ship Repair and Alteration Committee (SSRAC).
4. Opportunities exist to integrate additional coating and preservation related recordkeeping features into the software. Specifically, the system could be used to generate data for Local, State, and Federal environmental reporting requirements (e.g., Air Permits).
5. The two completed projects have resulted in a product which appears to meet the needs of one Navy Regional Maintenance Center. The product **MUST** be demonstrated on an active project before it will be fully accepted by the Navy. Based on the demonstration, an implementation strategy will need to be developed to facilitate regional obstacles to acceptance including training, security, and local acceptance processes.

Recommendations

1. Perform a pilot program with Navy QA/QC agencies (RMC and SUPSHIP) to gain acceptance of the electronically delivered inspection reports.
2. Ensure the continued support of system updates by the vendor either through widespread Navy acceptance of the system reports and/or by continued NSRP funding of system updates and improvements which may be necessary to obtain Navy acceptance.

Background

Proper evaluation of coating quality requires a trained individual to observe and measure elements of the process at various stages of coating application. Such quality assurance procedures can be expensive, inefficient, and difficult to administer.

NAVSEA painting practices require acquisition, recording, and reporting of QA data collected during surface preparation and coating processes. This data is collected after various critical stages in the process are completed (e.g., initial surface cleaning, surface preparation prior to painting, application of each coat, and final inspection). Data are also collected throughout the process to document the environmental conditions during surface preparation and coating activities. The data collected can be quite voluminous. Each inspection point may generate several sheets of paper records; over the course of a project such records may occupy several hundred pages.

By taking advantage of currently available technology, the Navy preservation community should be able to improve the efficiency of managing and collecting their QA/QC data. Table 1 shows some of the sources of cost reduction and process improvement beyond the reduction of paperwork.

Table 1 - Benefits of Paperless QA System

<u>Process Improvement</u>	<u>Cost Reduction</u>
<ul style="list-style-type: none">• Increase transparency of inspection to the surface preparation and coating process• Improve efficiency of inspection efforts• Transmit inspection data efficiently to decision-makers• Archive inspection data for future use• Leverage inspection data to its fullest extent• Content and Document Management capability• Integration with electronic measurement devices	<ul style="list-style-type: none">• Minimize or eliminate delays associated with adjudication of out of spec items• Reduce inspection cost• Expedite decision making, reducing analysis cost and associated downtime• Eliminate costs incurred to re-create history for assessments• More accessible information could be used for more efficient planning, facilitating process improvement, troubleshooting, etc.

In the mid-2000's, the National Surface Treatment Center developed a paperless QA software program. The system was originally called "QA Toolkit" and later re-named "Preservation Quality Assurance Data System (PQADS)." The program was a client server based system that was fully functional and implemented at Mayport Naval Station by the SERMC team in 2006. However, completion funding for that program was not available. Fleet Forces Command assumed responsibility for the paperless paint QA program. In 2009, the Coating Quality Assurance Tool Kit (CQATK) was developed by MI Technical Solutions through Navy program funding. The CQATK system was developed to record the data and make it available to the Navy through the MFOM. However after 3 years of effort it was determined the

CQATK did not support the technical requirements invoked in NAVSEA Standard Items 009-04 and 009-32. While CQATK remains an option in NSI 009-32, the Regional Maintenance Commands (RMCs) in Norfolk and Mayport have suspended the use of this system.

There is a continued need for an automated, hand-held device to gather, record, and assess the necessary QA data from surface preparation and coatings activities. A project sponsored by the DoD Corrosion Policy and Oversight office suggested that the Navy could save up to 2% of the cost of coating if they could implement an effective paperless QA system.¹ Assuming the Navy performs \$100 million in coatings work which could be affected by the process, \$2 million per year could be saved. A recent NSRP project corroborated the magnitude of potential cost savings.² Of the thirteen specific process improvements which would help the Navy reduce cost without sacrificing quality, an effective paperless QA system was ranked highest in terms of potential cost savings. Paperless QA was one of the few process improvements that would benefit all shipyards.

An initial NSRP SPC project³ successfully modified COTS (Commercial off-the-shelf) technology to output QA data in accordance with the requirements of Naval Sea Systems Command Standard Item 009-32. Key aspects of the final production application included:

- Electronic generation of eight appendices required by NSI 009-32
- PDF generation for an appendix only if data had been entered into that report's section
- Auto-fill fields after a tap based on what was entered in that field previously
- Pre-populate a field, regardless of tap, based on what was entered previously
- Improved "Add from Device" workflow for over-the-air import of data from the DeFelsko Positector WiFi gage, DeFelsko Smart Link gage, Defelsko RTR gage, Elcometer 224 gage, and Elcometer 456 gage.

Once the system was developed, the project team worked with Regional Maintenance Center QA representatives to identify a path forward to integrate the paperless capability into the Navy Maintenance process. Features which take advantage of the paperless technology include:

- Electronic event notification
- Auto-flag out of spec conditions
- Automate Non-Conformance reporting and resolution
- Quality control reports for contractor process improvement

The project team also identified varying degrees of technological (connectivity/security) challenges at each shipyard. Some shipyards will need to overcome internal IT issues before adopting the technology while others have fully integrated the technology into their production process.

¹ Corrosion Control Cost Reduction through Improved Quality Assurance Information Management, Project No: W07NS01

² NSRP Panel Project report titled Future State for Navy Ship Maintenance Painting, July 2013

³ NSRP Panel Project Report titled Robust Functional Paperless Paint, April 2015

Project Objectives and Methodologies

This project funded TruQC efforts with BAE Systems Southeast Shipyard, GD NASSCO San Diego, GD NASSCO Earl, their sub-contractors and government representatives to identify the needs of both new construction and repair yards. The objective was to establish a fully functional TruQC system that could populate 009-32 documentation, auto flag out of spec conditions, start the non-conformance process, and ensure resolution prior to resuming production. The project included four, interrelated tasks.

Task 1 –Set up project & Survey project yards. During this task, hardware and user accounts were provided to participating shipyards. Participating shipyards were surveyed to determine the extent to which they had specific needs, ancillary reporting requirements, or other issues which could be addressed by the project.

Task 2 - Discovery process and Data output development – The discovery process consisted of one on one meetings with each of the participating shipyards to identify the unique contract requirement data points of both new construction and repair facilities. During this process, TruQC identified unique administrative storage and reporting functionality of the software and the information exchange between the contractor, sub-contractor, and government inspector and their design engineering office. The administrative data input fields required to set up and maintain the Out Of Spec (OOS) condition reporting and parameters for notification were also established. Based on survey results, TruQC reconfigured the filing system to accommodate the way NSI 009-32 appendices track by work package versus the commercial daily inspection log in the industrial painting version of the software.

Task 3 Operational testing and measurement – Dedicated test platforms located at BAE Systems and GD NASSCO were utilized for consistency and validation testing of the OOS and ancillary reporting functions. The information collected and stored using this flagging system is available in original reports in addition to metrics and analytics which will allow for trend determination and possible process improvement.

In support of Task 3, TruQC and BAE worked with local contractors; GD NASSCO, Surface Technologies, IMIA, Southeast Regional Maintenance Center (SERMC) and NAVSEA to conduct a desk top event which was held on 25 - 27 August 2014 in Jacksonville FL. During this event, the team identified issues needing resolution before moving forward. This even is discussed in detail below.

Task 4 Technology Transfer – Presentations on the project were provided at the following meetings:

- April, 2014 NSRP SPC meeting Project updates – Jacksonville, FL
- June, 2014 Mega Rust Presentation Fall NSRP SPC meeting presentation – a San Diego, CA
- August, 2014 Table top exercise with the NAVSEA, and the SERMC – Jacksonville, FL
- September, 2014 NSRP SPC meeting Project updates – Biloxi, MS
- September, 2014 NAVSEA Day table top presentation – Washington DC
- March, 2014 NSRP Joint Panel meeting and SPC meeting breakout – Charleston, SC

Phase II Project Accomplishments

During the Phase I project, TruQC utilized their proprietary development template as a basis for customizing the existing system to meet the requirements of NSI 009-32. The process includes multiple phases which were detailed in a previous report. The project resulted in:

- Fully Functional, Truly Paperless QA Software program which populates commercially accepted forms as well as the NAVSEA appendices.
- More accurate data capture
- Reduction in coating inspection reporting times
- Reduction in data entry errors

This section provides a detailed discussion of the accomplishments of the Phase II project. The accomplishments are broken into three sections. The first section discussed the results of the tabletop demonstration with SERMC and BAE representatives. The second section provides detail on the system improvements and updates developed during this project. The third section discusses the implementation and technology transfer efforts as part of this project.

Tabletop Demonstration with NAVSEA Representatives

The Robust Functional Paperless Paint efforts have been supported by the NAVSEA Technical Warrant for coatings. However, the project team recognized the need to engage NAVSEA waterfront personnel to get their support for the system. SERMC has been a leader in the past two Navy paperless paint projects, so it was natural to engage them in this project.

In support of the Management Review Board (MRB) direction related to the contractor's work on a preservation Quality Assurance paperless records, a desk top event was held on 25 - 27 August 2014. There were participants from local contractors and Southeast Regional Maintenance Center (SERMC). The desk top was successful in identifying issues needing resolution before moving forward. Twenty-four technical items were identified related to Appendices 1 through 7A. In addition, the changes required for Appendix 8 to linked to the OOS auto flag feature were reviewed.

During the Table top review, it was recommended that the filing system should be organized so that a work item sub location can be located in the filing system by traditional means; users are used to holding a paper file. TruQC has integrated tags and conventional naming functions which allow for sorting and filtering in a fashion that may be more accurate and efficient than current methods. Both Navy and shipyard users will have to be trained on how to locate specific data.

Now that the improvements have been made, the system should be suitable for a pilot project using the paperless paint system. This pilot project was beyond the scope of the Phase II project. It is however critical to the implementation of the system.

System Improvements and Updates

During the Phase II project, a number of technical updates and improvements were made to the software to meet the needs of U.S. Navy Preservation requirements. Following is a brief description of the significant updates and improvements:

Electronic Event Notification – Templated emails can be developed on a case by case, yard by yard basis via an email template, i.e. : check point notification, paint spray notification, lift chit, hot work, etc. Due to the numerous versions and types of notifications TruQC developed a template in app version that can be used independently or in conjunction with any sub to contractor, contractor to owner or any other notification need in current format.

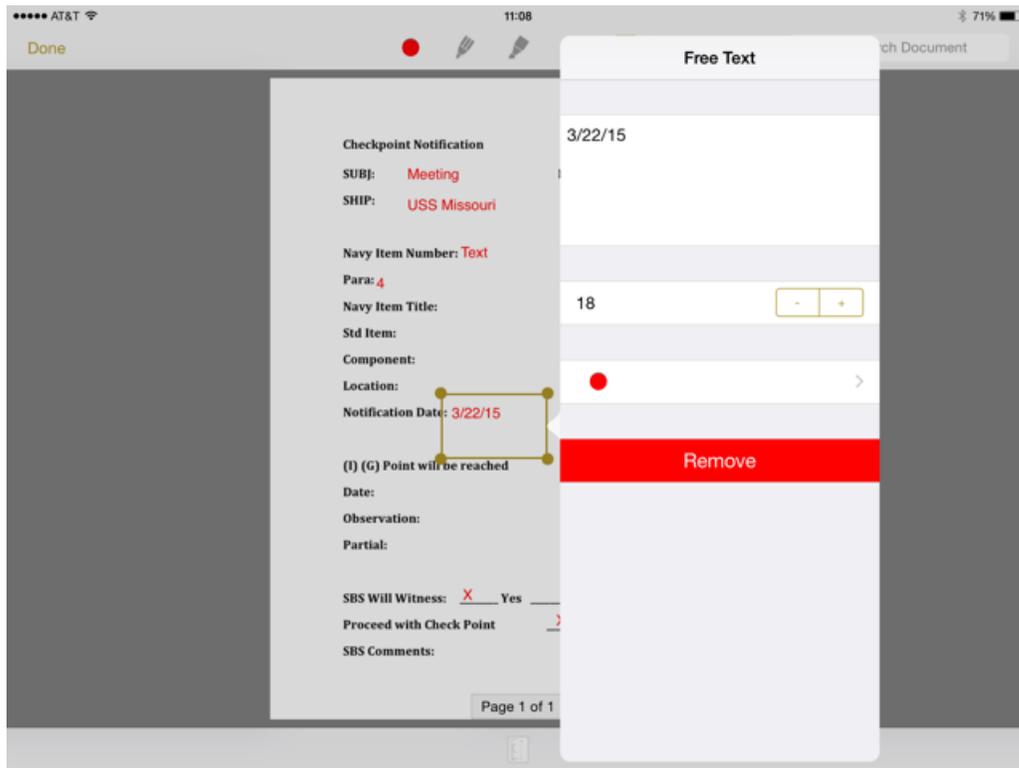
The image is a screenshot of a mobile application interface for creating an electronic event notification. The background is a form titled "Checkpoint Notification" with various fields: "SUBJ: Meeting", "SHIP: USS Missouri", "Navy Item Number: Text", "Para: 4", "Navy Item Title: 18", "Std Item:", "Component:", "Location:", "Notification Date: 3/22/15", "(I) (G) Point will be reached", "Date:", "Observation:", "Partial:", "SBS Will Witness: X Yes", "Proceed with Check Point", and "SBS Comments:". A "Free Text" dialog box is overlaid on the right side of the form, containing the date "3/22/15" and a red "Remove" button. The app's status bar at the top shows "AT&T", "11:08", and "71%".

Figure 1. Screenshot of Electronic Event Notification Template

Auto-Flag Out of Spec conditions – To enable the auto flag feature, Appendix 8 (CAP Sheet) needed to be developed. Appendix 8 contains the accept/reject criteria specific to the work being performed. Once Appendix 8 was completed, logic was developed to correlate the Appendix 8 data to the activity being inspected in the remaining appendices. Customized auto flagging is now possible based on all potential OOS items in the appendices. TruQC enables this to be done without the end users knowledge and is intuitive in app with no additional steps for the end user. A unique Appendix 8 admin area was developed to allow for the hard coding and creation of unique specs for work-items and processes in the blasting and painting work spec. Appendix A shows screen shots of these elements of the system.

Report Sections

US Navy Appendices FY13 #32

Tags Submit Add

General

Appendix 1 - Environmental Readings & Paint/Nonskid

Appendix 2 - SSPC-SP 1 Cleanliness Checkpoint

Appendix 3 - Surface Profile / Preparation & Cleanliness Log

Appendix 4 - Surface Conductivity / Chloride Log

Appendix 5 - Surface Cleanliness (Dust) Tape

Appendix 6 - Paint/Nonskid Application & Consumption Log

Appendix 7 - Dry Film Thickness Measurements

Appendix 7a - Wet Film Thickness Measurements

Date / Time

Reading Condition

Sat Unsat Remove Reading

Activity / Process

Comments

Prime Application

Dry Bulb Temp. Wet Bulb Temp. Surface Temp.

! 110 Read From Device

Dew Point Relative Humidity Contractor

Benjamin Chute

Gage Number Gage Cal. Due Signature

Gage Number Gage Cal. Due

Add From Device Add Reading

Paint / Nonskid Storage

Start Date / Time Product / Comp.

Benjamin Chute

Report File Cabinet Library Admin synced 4 minutes ago

Report Sections

US Navy Appendices FY13 #4

Tags Submit Add

General

Appendix 1 - Environmental Readings & Paint/Nonskid

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Appendix 7a - Wet Film Thickness Measurements

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR COATED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

NOTE #1 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN THE COMMENTS BLOCK.

NOTE #2 UNLESS OTHERWISE STATED IN SPECIFICATION, SURFACE TEMPERATURE MUST BE A MINIMUM OF 50 DEG F AND AT LEAST 5 DEG F ABOVE DEW POINT.

NOTE #3 ALL SPACES IN A SECTION ARE TO BE FILLED IN. IF NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

Inspection

I

Table Line Column

! 2 ! 6 ! C

Accept Criteria

Surface Temp. Storage Temp. Env % RH

40-140 40-100 85

Check for Ventilation Running (PW, RFW, & FWDC Tanks):

Sat Unsat

Readings

Date / Time

Reading Condition

04/29/2015, 17:13 Sat Unsat Remove Reading

Activity / Process

Comments

Megan Strick

Report File Cabinet Library Admin synced less than a minute ago

Figure 2. Red "indicator" pops up when a Non-Conforming Item appears, meaning an action is required.

Improved File Cabinet search ability across time removal – During industrial coatings projects, data is typically filed and accessed based on the date of the work (“inspectors daily reports”). In Navy projects, inspection data is filed and accessed based on the work item. This means that a single day may have several reports and reports for a single work item may involve multiple days spanning several weeks or months. To facilitate the Navy process, the file cabinet was reconfigured to sort and maintain files by job and item versus Day and date in order to maintain a complete appendix package for each work item. This process was a significant undertaking which also required eliminating a restriction limiting the data synchronization to the inspection device to the most recent 2 weeks.

Automate Non-conformance Reporting and Resolution – Non-conformance reporting is now in place and is customizable based on yard and whether the NCR is internal, sub to prime or prime to owner. The NCR is available in real time for review by all permitted parties. Edit, approval, photo, signature, annotation and blue-print annotation are all available to facilitate quick and effective communication.

Figure 3. Non-conformance Reporting Screen

QC Reports for contractor process improvement (Analytics and Metrics) – A form can be developed on a case by case, yard by yard basis. Custom analytics and metrics are available across any reports and/or data points in the app.

Updates to the software to ensure consistency with several versions of NSI 009-32 – The Navy has a process to annually update all of the NAVSEA Standard Items for Ship Repair (SSRAC). This process results in changes which impact the inspection, reporting, and acceptance requirement. Furthermore, at any given time a shipyard may be performing work which was contracted to various versions of the Standard Item. Therefore, the system needs to support the requirements of the most current as well as

legacy versions of NSI 009-32. Currently, FY 12, 13, 14 and 15 versions are fully supported by the system. The user selects which version of the Standard Item they are working toward as shown in Figure 4. The system will require annual updates to remain current.

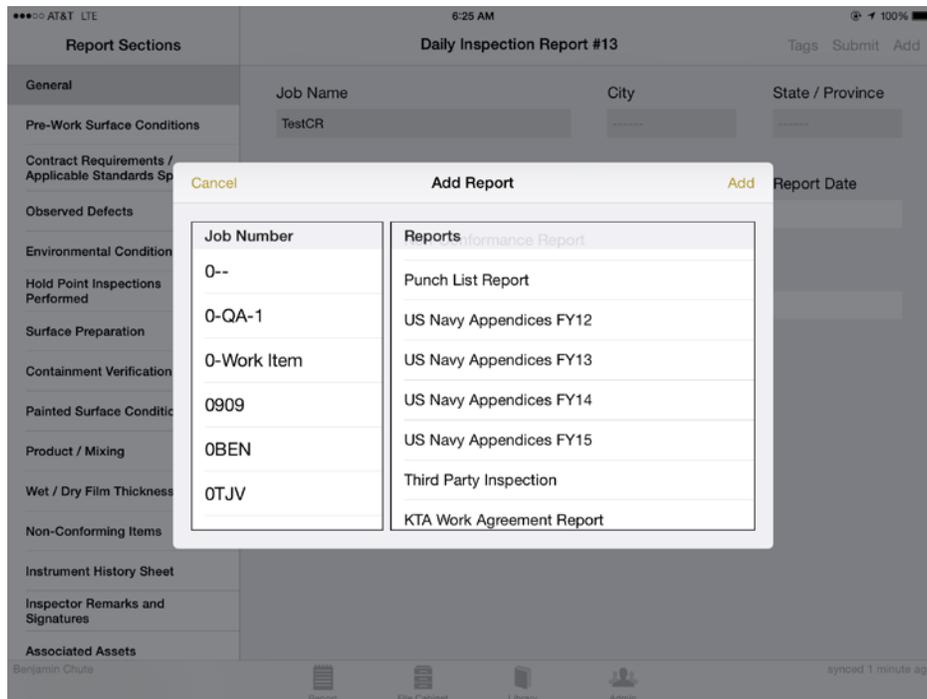


Figure 4. Navy Appendices with unique changes and revisions available for FY '12, '13, '14, '15

Implementation/Tech Transfer

At the end of this project, twenty-seven (27) users at 6 NSRP shipyards have worked with the system. The system is currently being used by some NSRP shipyards for commercial work. NASSCO and BAE SSI are using to support inspection on IMO PSPC contracts.

For US Navy ship repair work, the TruQC system generates a “paper” (or .pdf) version of the NSI 009-32 Appendices which must be printed, signed and submitted to NAVSEA. Appendix B contains a representative report. The Southeast Regional Maintenance Center (SERMC) has determined that the system is ready for a demonstration project which would take advantage of the electronic reporting features during US Navy ship repair preservation work. Based on the demonstration, an implementation strategy will need to be developed to facilitate regional obstacles to acceptance including training, security, and local acceptance processes.

Appendix A – CAP Sheet Feature (Appendix 8)

APPENDIX 8: 123-11-011-123-456-789-UNDER WATER HULL



Started: - Location: N/A Submitted: N/A - Location: N/A Approved: N/A

Job Number: 123-11-011

GENERAL

Ship Name & Hull #: USS Missouri Contract / Task Order / CLIN / TWD: Abc Work Item: 123-456-789 Location: Under Water Hull

TECHNICAL STANDARDS

Fiscal Year: 15 Surface Prep: Table 1 / Line 2 / Column A Coating: Table / Line / Column

SURFACE PREPARATION

SET 1
Type of Surface Preparation: SSPC-SP-10 / NACE NO. 2 Profile Range: 4 to 6 mils

SCOPE OF PRESERVATION

Standard Preservation: Yes Touch Up: Yes Other:

COATINGS CONTRACTOR

Prime Contractor: Contractor 1 Subcontractor / Applicator: Sub 1 Contractor Name: Contractor 2 Contractor Phone Number: 314-555-3456

PROPERTIES

COAT 1
Coat: Prime Coat Vol Solids:
Coating Manufacturer: Carboline VOC's IAW F-718:
Product Applied: Induct Time:
Curing Agent: Flash Point: N/A
Mix Ratio: Shelf Life: N/A months
Pot Life: N/A mins @

APPLICATION

COAT 1
Coat: Prime Coat Surface Temp: 50°F to 60°F
Color: Gray Ambient Temp: 50°F to 60°F
Application Method: Airless % Relative Humidity:
Wet Film Thickness: 4 to 6 mils Dry Times Based On: @ RH
Dry Film Thickness: 4 to 6 mils Recoat Hours: hours
To Handle / Touch Hours: hours
Immersion / Service Hours: hours

Appendix B – Representative TruQC Generated Appendices

APPENDIX 1
QA INSPECTION FORM - ENVIRONMENTAL READINGS & PAINT/NONSKID STORAGE

SHIP NAME & HULL #: Portlandia bridge to nowhere CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy DATE/TIME: N/A N/A
 LOCATION: T WORK ITEM: 02112 PARA. NO.: T
 (I) (V) N/A (G) N/A PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T TABLE: N/A LINE: N/A COLUMN: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR COATED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

NOTE #1 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN THE COMMENTS BLOCK.
NOTE #2 UNLESS OTHERWISE STATED IN SPECIFICATION, SURFACE TEMPERATURE MUST BE A MINIMUM OF 50 DEG F AND AT LEAST 5 DEG F ABOVE DEW POINT.
NOTE #3 ALL SPACES IN A SECTION ARE TO BE FILLED IN. IF NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

ACCEPT CRITERIA: ENV: %RH: N/A SURFACE TEMP: MIN: N/A MAX: N/A STORAGE TEMP: MIN: N/A MAX: N/A

Date	Time	Enter Activity/Process: Cleanliness Check, Surface Preparation, Prime Application, Prime Cure, Stripe Application, Stripe Cure, Intermediate Application, Intermediate Cure, Tack Application, Top Coat Application, Top Coat Cure, etc.	Substrate Surface Temp. (°F)	Dew Point (°F)	% RH	Dry Bulb (Ambient Temp) (°F)	Wet Bulb (°F)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gage #		N/A Gage Cal Due Date: N/A	Condition of Reading SAT: <input type="text" value="N/A"/>		UNSAT: <input type="text" value="N/A"/>		
Gage #		N/A Gage Cal Due Date: N/A					
Contractor (Print):		N/A Contractor (Signature): N/A					
COMMENTS:		N/A					
Date	Time	Enter Activity/Process: Cleanliness Check, Surface Preparation, Prime Application, Prime Cure, Stripe Application, Stripe Cure, Intermediate Application, Intermediate Cure, Tack Application, Top Coat Application, Top Coat Cure, etc.	Substrate Surface Temp. (°F)	Dew Point (°F)	% RH	Dry Bulb (Ambient Temp) (°F)	Wet Bulb (°F)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gage #		N/A Gage Cal Due Date: N/A	Condition of Reading SAT: <input type="text" value="N/A"/>		UNSAT: <input type="text" value="N/A"/>		
Gage #		N/A Gage Cal Due Date: N/A					
Contractor (Print):		N/A Contractor (Signature): N/A					
COMMENTS:		N/A					
Date	Time	Enter Activity/Process: Cleanliness Check, Surface Preparation, Prime Application, Prime Cure, Stripe Application, Stripe Cure, Intermediate Application, Intermediate Cure, Tack Application, Top Coat Application, Top Coat Cure, etc.	Substrate Surface Temp. (°F)	Dew Point (°F)	% RH	Dry Bulb (Ambient Temp) (°F)	Wet Bulb (°F)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gage #		N/A Gage Cal Due Date: N/A	Condition of Reading SAT: <input type="text" value="N/A"/>		UNSAT: <input type="text" value="N/A"/>		
Gage #		N/A Gage Cal Due Date: N/A					
Contractor (Print):		N/A Contractor (Signature): N/A					
COMMENTS:		N/A					

Paint/Nonskid Storage						
Date	Time/Time Range	Enter Product/Component & Prime, Stripe, Intermediate, Tack, Top Coat	Min. & Max. Temp. for 24hr Period Prior to Initiation of Application	--OR-- Storage Temp. Manually Measured	--OR-- Core Temp. After Component Mixed	Method of Measurement
N/A	N/A / N/A	N/A N/A	Min: N/A /Max: N/A	N/A	N/A	N/A
Contractor (Print):		N/A	Contractor (Signature):		N/A	
COMMENTS:		N/A				

APPENDIX 2

QA INSPECTION FORM - SSPC-SP 1 CLEANLINESS CHECKPOINT

SHIP NAME & HULL #: Portlandia bridge to nowheres **CONTRACT/TASK ORDER/CLIN/TWD:** Todd's test job for Navy **DATE/TIME:** N/A N/A
LOCATION: T **WORK ITEM:** 02112 **PARA. NO.:** T
(I) **(V)** N/A **(G)** N/A **PRODUCT BEING APPLIED:** T

REQ'T DOCUMENT: NSTM 631 **/FY:** T **SQFT OF AREA PRESERVED:** N/A **PARTIAL AREA:** N/A **FINAL:** N/A
(NSTM 631, 634, PPI, NSI 009-32 FY)

Accomplish SSPC-SP-1 degreasing/cleaning to ensure the removal of surface contaminants.	Date/Time: N/A	SAT: <input type="checkbox"/> N/A	UNSAT: <input type="checkbox"/> N/A
Accomplish degreasing/cleaning a maximum of 4 hrs. prior to surface preparation, ensuring the adequate removal of surface contaminants.	Date/Time: N/A	SAT: <input type="checkbox"/> N/A	UNSAT: <input type="checkbox"/> N/A
If evidence of contamination exists, accomplish degreasing/cleaning a maximum of 4 hrs. prior to the application of each coat of paint to ensure removal of surface contaminants.	Date/Time: N/A	SAT: <input type="checkbox"/> N/A	UNSAT: <input type="checkbox"/> N/A

COMMENTS: N/A

Contractor (Print): N/A	Contractor (Signature): N/A	Date/Time: N/A
Subcontractor (Print): N/A	Subcontractor (Signature): N/A	Date/Time: N/A
Govt. Insp. (Print): N/A	Govt. Insp. (Signature): N/A	Date/Time: N/A

APPENDIX 3
QA INSPECTION FORM - SURFACE PROFILE / PREPARATION & CLEANLINESS LOG

SHIP NAME & HULL #: Portlandia bridge to nowhere CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy DATE/TIME: N/A N/A
 LOCATION: T WORK ITEM: 02112 PARA. NO.: T
 (I) (V) N/A (G) N/A PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T SQFT OF AREA PRESERVED: N/A PARTIAL AREA: N/A FINAL: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR PAINTED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

- NOTE #1** FOR PAINTS: 1 PROFILE READING REQUIRED FOR EVERY 200 SQFT (3 INDIVIDUAL TAPES FOR METHOD C) FOR THE FIRST 1000 SQFT AREA (15 INDIVIDUAL TAPES TOTAL FOR METHOD C); 1 PROFILE READING REQUIRED FOR EACH ADDITIONAL 500 SQFT OR LESS AREA (3 INDIVIDUAL TAPES FOR METHOD C).
NOTE #2 FOR NONSKID: 1 PROFILE READINGS REQUIRED EVERY 100 SQFT (3 INDIVIDUAL TAPES FOR METHOD C) FOR THE FIRST 500 SQFT AREA (15 INDIVIDUAL TAPES TOTAL FOR METHOD C); IF READINGS ARE SATISFACTORY, 1 PROFILE READING PER 1000 SQFT REMAINING (3 INDIVIDUAL TAPES FOR METHOD C).
NOTE #3 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN THE COMMENTS BLOCK
NOTE #4 IF SPACES ARE NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

ACCEPT CRITERIA:	PROFILE RANGE	N/A	MILS	TO	N/A	MILS
						Mils (Average of 3 tapes)
Reading: N/A mils	Reading: N/A mils		Reading: N/A mils			N/A mils
Reading: N/A mils	Reading: N/A mils		Reading: N/A mils			N/A mils
Reading: N/A mils	Reading: N/A mils		Reading: N/A mils			N/A mils
Reading: N/A mils	Reading: N/A mils		Reading: N/A mils			N/A mils
Reading: N/A mils	Reading: N/A mils		Reading: N/A mils			N/A mils
TOTAL AVG:						N/A

COMMENTS: N/A

Abrasive Manufacturer: N/A Type: N/A Mesh Size: N/A
 (if Applicable) (if Applicable) (if Applicable)
 TYPE OF SURFACE PREPARATION: N/A

GAGE # N/A GAGE CAL DUE DATE: N/A	(Base Metal Reading) (Type 1 gage) BMR N/A	SURFACE PROFILE INSP: SAT: <input type="checkbox"/> N/A UNSAT: <input type="checkbox"/> N/A	SURFACE PREP. INSP: SAT: <input type="checkbox"/> N/A UNSAT: <input type="checkbox"/> N/A	CLEANLINESS INSP: SAT: <input type="checkbox"/> N/A UNSAT: <input type="checkbox"/> N/A
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Contractor (Print): N/A	Contractor (Signature): N/A	Date/Time: N/A
Subcontractor (Print): N/A	Subcontractor (Signature): N/A	Date/Time: N/A
Govt. Insp. (Print): N/A	Govt. Insp. (Signature): N/A	Date/Time: N/A

APPENDIX 5
QA INSPECTION FORM - SURFACE CLEANLINESS (DUST) TAPE

SHIP NAME & HULL #: Portlandia bridge to nowhere
 CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy
 DATE/TIME: N/A N/A
 LOCATION: T
 WORK ITEM: 02112
 PARA. NO.: T
 (I) (V) N/A (G) N/A
 PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T
 SPECIFIC FEATURES OF AREA TO BE TESTED: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)
 ADHESIVE TAPE TYPE(S) FOR DUST MEASUREMENT: N/A

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR COATED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

- NOTE #1** FOR UNDERWATER HULL, 1 PROFILE READING REQUIRED FOR EVERY 200 SQFT FOR THE FIRST 1000 SQFT AREA; IF READINGS ARE SATISFACTORY, 1 INDIVIDUAL READING REQUIRED FOR EACH ADDITIONAL 500 SQFT OR LESS AREA.
NOTE #2 FOR FLIGHT DECK NONSKID, 3 INDIVIDUAL READINGS REQUIRED EVERY 100 SQFT FOR THE FIRST 500 SQFT; IF READINGS ARE SATISFACTORY, 1 INDIVIDUAL READING PER 1000 SQFT REMAINING.
NOTE #3 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN THE COMMENTS BLOCK.
NOTE #4 IF SPACES ARE NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

Spot Measurement	Dust Quantity Rating	Dust Size Class	Approximate Location
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Spot Measurement	Dust Quantity Rating	Dust Size Class	Approximate Location
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Spot Measurement	Dust Quantity Rating	Dust Size Class	Approximate Location
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Spot Measurement	Dust Quantity Rating	Dust Size Class	Approximate Location
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Spot Measurement	Dust Quantity Rating	Dust Size Class	Approximate Location
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

CONDITION OF CHECKPOINT	
SAT: <input type="checkbox"/> N/A	UNSAT: <input type="checkbox"/> N/A

COMMENTS: N/A

Contractor (Print): N/A	Contractor (Signature): N/A	Date/Time: N/A
Subcontractor (Print): N/A	Subcontractor (Signature): N/A	Date/Time: N/A
Govt. Insp. (Print): N/A	Govt. Insp. (Signature): N/A	Date/Time: N/A

APPENDIX 6
QA INSPECTION FORM - PAINT/NONSKID APPLICATION AND CONSUMPTION LOG

SHIP NAME & HULL #: Portlandia bridge to nowhere CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy DATE/TIME: N/A N/A
 LOCATION: T WORK ITEM: 02112 PARA. NO.: T
 (I) (V) N/A (G) N/A PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T TABLE: N/A LINE: N/A COLUMN: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR PAINTED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

	Prime Coat	Stripe Coat (if applicable)	Intermediate Coat (if applicable)	Stripe Coat (if applicable)	Topcoat	Other
Application Method: Plural Airless, Conventional Airless, Brush, Roller, Conventional Spray	N/A	N/A	N/A	N/A	N/A	N/A
Airless Pump Ratio (if Plural Component): Fixed: <input type="text" value="N/A"/> Variable: <input type="text" value="N/A"/>	N/A	N/A	N/A	N/A	N/A	N/A
If Using Inline Heater, Temp in °F (Fahrenheit)	Temp. Setting At Heater	N/A	N/A	N/A	N/A	N/A
	Temp. At Tip	N/A	N/A	N/A	N/A	N/A
Product Applied	N/A	N/A	N/A	N/A	N/A	N/A
Product Manufacturer	N/A	N/A	N/A	N/A	N/A	N/A
Color Applied	N/A	N/A	N/A	N/A	N/A	N/A
Base Portion Batch No # (Part A)	N/A	N/A	N/A	N/A	N/A	N/A
Expiration Date (Part A)	N/A	N/A	N/A	N/A	N/A	N/A
Hardener Portion Batch No # (Part B)	N/A	N/A	N/A	N/A	N/A	N/A
Expiration Date (Part B)	N/A	N/A	N/A	N/A	N/A	N/A
Gallons Used Per Coat	N/A	N/A	N/A	N/A	N/A	N/A
Square Feet Covered	N/A	N/A	N/A	N/A	N/A	N/A
Start (Date/Time)	N/A	N/A	N/A	N/A	N/A	N/A
Stop (Date/Time)	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX 7
QA INSPECTION FORM - DRY FILM THICKNESS MEASUREMENTS

SHIP NAME & HULL #: Portlandia bridge to nowhere CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy DATE/TIME: N/A N/A
 LOCATION: T WORK ITEM: 02112 PARA. NO.: T
 (I) (V) N/A (G) N/A PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T SQFT OF AREA PRESERVED: N/A PARTIAL AREA: N/A FINAL: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR PAINTED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

NOTE #1 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN COMMENTS BLOCK.
NOTE #2 IF SPACES ARE NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

Select Type of Gage being used: Type 1 N/A Type 2 N/A Base Metal Reading (Type 1 gage): N/A
 Gage # N/A Current Calibration Due Date: N/A Accuracy Adjustment (Type 1 gage): N/A

ACCEPTANCE CRITERIA

N/A PRIMER COAT DRF N/A TO N/A MILS N/A TOPCOAT DRF N/A TO N/A MILS
 N/A INTERMEDIATE COAT DRF N/A TO N/A MILS N/A TOTAL SYSTEM DRF N/A TO N/A MILS
 N/A STRIPE COAT (for cleanliness & holiday QA)

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

Note: Each Spot Measurement = The AVG of Three Gage Readings.

SPOT MEASUREMENT	DFT (Miles) AVG of 3 Gage Readings	Approximate Location
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
Average:	N/A	

HOLIDAY INSP: SAT N/A UNSAT N/A DFT INSP: SAT N/A UNSAT N/A N/A (for stripe coat)
 CLEANLINESS INSP: SAT N/A UNSAT N/A CHLORIDE/CONDUCTIVITY INSP: SAT N/A UNSAT N/A N/A (for stripe coat)
COMMENTS: N/A

Contractor (Print): N/A	Contractor (Signature): N/A	Date/Time: N/A
Subcontractor (Print): N/A	Subcontractor (Signature): N/A	Date/Time: N/A
Govt. Insp. (Print): N/A	Govt. Insp. (Signature): N/A	Date/Time: N/A

APPENDIX 7A
QA INSPECTION FORM - WET FILM THICKNESS MEASUREMENTS

SHIP NAME & HULL #: Portlandia bridge to nowhere CONTRACT/TASK ORDER/CLIN/TWD: Todd's test job for Navy DATE/TIME: N/A N/A
 LOCATION: T WORK ITEM: 02112 PARA. NO.: T
 (I) (V) N/A (G) N/A PRODUCT BEING APPLIED: T
 REQ'T DOCUMENT: NSTM 631 /FY: T SQFT OF AREA PRESERVED: N/A PARTIAL AREA: N/A FINAL: N/A
 (NSTM 631, 634, PPI, NSI 009-32 FY)

MAINTAIN SEPARATE LOG FOR EACH AREA/LOCATION, PREPARED OR PAINTED SURFACE. WHEN AN AREA IS DIVIDED INTO SEPARATE SECTIONS, MAINTAIN A SEPARATE LOG FOR EACH SECTION.

NOTE #1 FOR ANY UNSAT CONDITION FOUND, PROVIDE THE TECHNICAL ADJUDICATION AND CORRECTIVE ACTION TAKEN IN COMMENTS BLOCK WHERE REQUIRED IN LIEU OF DFT.
NOTE #2 IF SPACES ARE NOT APPLICABLE, INSERT N/A. UNUSED SECTIONS SHALL BE CROSSED OUT AND MARKED N/A.

Indicate Coating System Sequence

N/A Prime Coat N/A Intermediate Coat (if applicable) N/A Topcoat
 N/A Stripe Coat (if applicable) N/A Stripe Coat (if applicable) Other Coat (specify) ()

METALLIC SURFACES

2 SPOT READINGS PER 1000 SQFT:
 0 - 1000 SQFT = 2 SPOTS REQUIRED
 1001 - 2000 SQFT = 4 SPOTS REQUIRED

NON-METALLIC SURFACES

0 - 100 SQFT = 5 SPOTS REQUIRED
 101 - 200 SQFT = 10 SPOTS REQUIRED
 201 - 1000 SQFT = 15 SPOTS REQUIRED
 > 1000 SQFT = 5 SPOTS REQUIRED PER 1000 SQFT AREA

WFT Measurement Number	Location of Readings	WFT Measurement IAW ASTM D 4414
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	N/A	N/A
11	N/A	N/A
12	N/A	N/A
13	N/A	N/A
14	N/A	N/A
15	N/A	N/A
16	N/A	N/A
17	N/A	N/A
18	N/A	N/A
19	N/A	N/A
20	N/A	N/A

COMMENTS: N/A

Contractor (Print): N/A	Contractor (Signature): N/A	Date/Time: N/A
Subcontractor (Print): N/A	Subcontractor (Signature): N/A	Date/Time: N/A
Govt. Insp. (Print): N/A	Govt. Insp. (Signature): N/A	Date/Time: N/A