Preparing Activity: NAVFAC Superseding
UFGS-09 97 13.17 (February 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION TABLE OF CONTENTS

DIVISION 09 - FINISHES

SECTION 09 97 13.17

THREE COAT EPOXY INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS

05/22

PART 1 GENERAL

1.1 REFERENCES
1.2 DEFINITIONS
1.3 SUBMITTALS
1.4 QUALITY ASSURANCE
1.4.1 Contract Errors, Omissions, and Other Discrepancies
1.4.2 Corrective Action (CA)
1.4.2.1 Corrective Action Procedures
1.4.2.2 Corrective Action Request (CAR) Form
1.4.2.3 Corrective Action Log
1.4.3 Coatings Work Plan
1.4.4 Design Data
1.4.4.1 Environmental Control System
1.4.4.2 Use of Door Sheet Access Way
1.4.5 Test Reports
1.4.5.1 Coatings Qualification Test Reports
1.4.5.2 Joint Sealant Qualification Test Reports
1.4.5.3 Ferrous Metallic Abrasive Qualification Test Reports
1.4.5.4 Non-Metallic Abrasive Qualification Test Reports
1.4.5.5 Recycled Ferrous Metallic Abrasive Field Test Reports (Daily and Weekly)
1.4.6 Qualifications
1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)
1.4.6.2 Qualifications of Certified Protective Coatings Specialist (PCS)
1.4.6.3 Qualifications of Coatings Inspection Company
1.4.6.4 Qualifications of Quality Assurance Coatings Inspector
1.4.6.5 Qualifications of Coatings Contractors
1.4.6.6 Qualifications of Individuals Performing Abrasive Blasting
1.4.6.7 Qualifications of Individuals Applying Coatings
1.4.6.8 Qualifications of Testing Laboratory for Coatings
1.4.6.9 Qualifications of Testing Laboratory for Abrasive
1.4.6.10 Coating Materials Certificate of Conformance

1.4.6.11 Joint Sealant Materials Certificate of Conformance
1.4.6.12 Joint Sealant Compatibility
1.4.6.13 Ferrous Metallic Abrasive Certificate of Conformance
1.4.6.14 Non-Metallic Abrasive Certificate of Conformance
1.4.7 QA and QC Personnel
1.4.7.1 QC Manager
1.4.7.2 Protective Coatings Specialist (PCS)
1.4.7.3 Quality Assurance Coatings Inspector
1.4.7.4 Coatings Contractor QC Coatings Inspector
1.4.8 Pre-Application Meeting
1.5 PRODUCT DATA
1.5.1 Joint Sealant Instructions
1.5.2 Coating System Instructions
1.6 DELIVERY AND STORAGE
1.7 COATING HAZARDS
1.8 WORK SEQUENCE
1.9 JOB SITE REFERENCES

PART 2 PRODUCTS

2.1 COATING SYSTEM
2.1.1 Epoxy Primer, Intermediate, and Topcoats
2.1.1.1 Epoxy Primer Coat
2.1.1.2 Epoxy Intermediate Coat
2.1.1.3 Epoxy Topcoat
2.2 JOINT SEALANT
2.3 COATING FIELD COLLECTION KIT
2.4 ABRASIVE FIELD COLLECTION KIT
2.5 INSPECTION TEST KITS
2.5.1 Test Kit for Measuring Chloride, Sulfate, and Nitrate Ions on Steel and Coated Surfaces
2.5.2 Test Kit for Measuring Chlorides in Abrasives
2.5.3 Test Kit for Identifying Amine Blush on Epoxy Surfaces
2.6 ABRASIVE
2.6.1 Ferrous Metallic Abrasive
2.6.1.1 New and Remanufactured Steel Grit
2.6.1.2 Recycled Steel Grit
2.6.2 Non-Metallic Abrasive

PART 3 EXECUTION

3.1 REMOVAL OF COATINGS CONTAINING HAZARDOUS MATERIALS
3.2 DOOR SHEET ACCESS WAY
3.3 FIELD SAMPLE COLLECTION AND TESTING
3.3.1 Coating Field Sample Collection
3.3.2 Abrasive Field Sample Collection
3.3.3 Coating Field Test Reports
3.3.4 Abrasive Field Test Reports
3.4 FUEL REMOVAL AND TANK CLEANING
3.5 LIGHTING
3.6 ENVIRONMENTAL CONDITIONS
3.6.1 Tank Containment
3.6.2 Control System Requirements
3.6.2.1 Automated Monitoring Requirements
3.6.2.2 Humidity Control for Surface Preparation and Primer Application
3.6.2.3 Humidity Control for Application of Intermediate and Topcoats and Initial Curing
3.7 EQUIPMENT USED IN TANK

3.8 SURFACES TO BE COATED
3.9 SURFACE PREPARATION
3.9.1 Abrasive Blasting Equipment
3.9.2 Operational Evaluation of Abrasive
3.9.3 Surface Standard
3.9.4 Pre-Preparation Testing for Surface Contamination
3.9.4.1 Pre-Preparation Testing for Oil and Grease Contamination
3.9.4.2 Pre-Preparation Testing for Soluble Salts Contamination
3.9.5 Abrasive Blasting
3.9.6 Disposal of Used Abrasive
3.9.7 Pre-Application Testing for Surface Contamination
3.9.7.1 Pre-Application Testing for Oil and Grease Contamination
3.9.7.2 Pre-Application Testing for Soluble Salts Contamination
3.9.7.3 Pre-Application Testing for Surface Cleanliness
3.10 MIXING AND APPLICATION OF COATING SYSTEM AND SEALANT
3.10.1 Preparation of Sealant and Coating Materials for Application
3.10.1.1 Mixing
3.10.1.2 Pot Life
3.10.1.3 Application Conditions and Recoat Windows
3.10.2 Amine Blush Testing of Epoxy Coat Prior to Overcoating
3.10.3 Application of Coating System and Joint Sealant
3.10.3.1 Application of STRIPE COAT
3.10.3.2 Application of Primer
3.10.3.3 Application of Intermediate Coat
3.10.3.4 Application of Topcoat
3.10.3.5 Application of Joint Sealant
3.10.4 Holiday Testing
3.10.5 Tank Occupancy After Coating Application
3.10.6 Procedure for Holiday and Spot Repairs of Newly Applied Coating
3.10.7 Extended Cure of Coating System Prior to Immersion Service
3.11 PROJECT IDENTIFICATION
3.12 FIELD QUALITY CONTROL
3.12.1 Field Inspection
3.12.1.1 Inspection and Documentation Requirements
3.12.1.2 Inspection Report Form
3.12.1.3 Daily Inspection Reports
3.12.1.4 Inspection Logbook
3.12.1.5 Inspection Equipment
3.12.1.5.1 Black Light
3.12.2 Coatings Contractor QC Coatings Inspector's Field Responsibilities
3.12.3 Quality Assurance Coatings Inspector's Field Responsibilities
3.13 FINAL CLEANUP

-- End of Section Table of Contents --

Preparing Activity: NAVFAC

Superseding
UFGS-09 97 13.17 (February 2010)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023

SECTION 09 97 13.17

THREE COAT EPOXY INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS
05/22

NOTE: This guide specification covers the requirements for a three-coat epoxy system for interior coating of newly constructed, bulk fuel storage tanks. For maintenance coating design, see notes herein. Severe corrosion and corrosion pitting are not addressed in this specification.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: This specification should be edited by an AMPP (Association for Materials Protection and Performance) (previously SSPC) certified Protective Coatings Specialist (PCS) that has five or more years of experience preparing coating specifications.

The designer should not alter the products and processes specified herein without thorough knowledge of the need for the changes and the implications of those changes.

NOTE: SSPC and NACE have merged to become AMPP. The merger was still in progress at the time this section was released.
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NOTE: The metric standard for measuring coating thickness is microns (25.4 microns=1 mil; use nominal 25 microns=1 mil).
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NOTE: This specification is for a three-coat, thin film system, which is compliant with Environmental Protective Agency (EPA) volatile organic compound (VOC) regulations as of June 2000.

- Epoxy Coats 350 grams per liter (g/l) 2.8 pounds per gallon (lbs/gal) maximum VOC

The designer must review state and local regulations and determine whether the coating in this Section complies with restrictions on VOC and other chemical constituents.
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NOTE: Tailor the SURFACE PREPARATION paragraph and subparagraphs to the needs of cleaning that will be required in preparation for repairs, and note that the abrasive blasting for inspection should be accomplished in such a manner that it does not conflict with any surface condition requirements in this Section, such as creating excessive surface profile that may require excessive primer thickness. For repair projects, specify appropriate portions of the steel surfacing requirements (according to NACE RPO178) from Section 33 56 21.17 SINGLE WALL ABOVE GROUND FIXED ROOF STEEL POL STORAGE TANK.
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NOTE: Designs for fuel tank linings should be based on recent inspections. Wherever possible, a coating inspection, or coating condition survey (CCS), as described in Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES, should be accomplished prior to designing a coating project for fuel tank interiors. Without a competent inspection, there is no reliable way to determine the type or condition of the existing coating system. If existing conditions are not known, proper (effective and financially supportable) surface preparation or coating system selection cannot be made. It is not always cost effective to replace the entire coating system in a fuel tank; however, this is the tendency in preparing a design without inspection results.

Do not provide general overcoat to a fuel tank lining unless recommended in a CCS to add corrosion protection. Provide complete removal and replacement, or repairs to existing coating, as deemed appropriate. Overcoating the interior of a tank is generally a liability unless extraordinary measures are taken to ensure adhesion to the old coating, regardless of whether it is epoxy or urethane.

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NOTE: Designers are encouraged to contact Robert Jamond (robert.jamond@navy.mil) prior to beginning a new Navy design.

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NOTE: Designers are encouraged to contact the Air Force Civil Engineer Reachback Center (afcec.rbc@us.af.mil) prior to beginning a new Air Force design.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API Std 650 (2013; Errata 1 2013; Addendum 1 2014; Errata 2 2014; Addendum 2 2016; Addendum 3 2018) Welded Tanks for Oil Storage

API Std 653 (2014; Addendum 1 2018) Tank Inspection, Repair, Alteration, and Reconstruction

ASTM INTERNATIONAL (ASTM)

ASTM C920 (2018) Standard Specification for Elastomeric Joint Sealants

ASTM D3276 (2015; E 2016) Standard Guide for Painting Inspectors (Metal Substrates)

ASTM D3335 (1985a; R 2020) Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy

ASTM D3718 (1985a; R 2015) Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy

ASTM D3925 (2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings

ASTM D4285 (1983; R 2018) Indicating Oil or Water in Compressed Air

ASTM D4417 (2021) Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel

ASTM D4940 (2015) Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blast Cleaning Abrasives

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 8502-3 (2017) Preparation of Steel Substrates Before Application of Paints and Related Products - Tests for the Assessment of Surface Cleanliness - Part 3: Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure-Sensitive Tape Method)

ISO 9001 (2015) Quality Management Systems-Requirements

NACE INTERNATIONAL (NACE)

NACE SP0178 (2007) Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service

NACE SP0188 (1999; R 2006) Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 1 (2015; E 2017) Mineral and Slag Abrasives

SSPC AB 2	(2015; E 2016) Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC AB 3	(2003; E 2004) Ferrous Metallic Abrasive
SSPC Guide 12	(2023) Guide for Illumination of Industrial Painting Projects
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC PA 2	(2015; E 2018) Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC PA Guide 11	(2020) Protecting Edges, Crevices, and Irregular Steel Surfaces by Stripe Coating
SSPC QP 1	(2019) Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors (Field Application to Complex Industrial Steel Structures and Other Metal Components)
SSPC QP 2	(2019) Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors (Removal of Hazardous Coatings from Structures)
SSPC QP 5	(2022) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC QS 1	(2015) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC SP 11	(2020) Surface Preparation Standard No. 11 - Power Tool Cleaning to Bare Metal
SSPC SP COM	(2016; E 2017) Surface Preparation Commentary for Steel and Concrete Substrates
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC-SP WJ-1/NACE WJ-1	(2012) Clean to Bare Substrate, Waterjet Cleaning of Metals
SSPC-SP WJ-2/NACE WJ-2	(2012) Very Thorough Cleaning, Waterjet Cleaning of Metals

SSPC-SP WJ-3/NACE WJ-3	(2012) Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-4/NACE WJ-4	(2012) Light Cleaning, Waterjet Cleaning of Metals

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-STD-595A	(2017) Colors used in Government Procurement

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441	(2009; Rev D; Notice 1 2021) Paint, Epoxy-Polyamide, General Specification for
MIL-DTL-24441/29	(2009; Rev B; Notice 1 2021) Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type IV
MIL-DTL-24441/31	(2009; Rev B; Notice 1 2021) Paint, Epoxy-Polyamide, White, Formula 152, Type IV

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910-SUBPART Z	Toxic and Hazardous Substances
29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1000	Air Contaminants
29 CFR 1926.59	Hazard Communication

1.2 DEFINITIONS

Definitions are generally provided throughout this Section in the paragraphs where used and denoted by capital letters. The following definitions are used throughout this Section:

a. ROOF - Interior tank surfaces that extend from the horizontal plane at the designated maximum fuel line upward, including the upper portion of the tank shell (walls), columns, structural steel, the underside of the roof plates, and other steel components in this area.

b. SHELL - Interior tank surfaces that extend along the vertical tank walls between the horizontal planes approximately 1 meter 40 inches above the shell-to-bottom joint upward to the horizontal plane at the designated fuel line, including columns, wall plates, and other steel components in this area.

c. BOTTOM - Interior tank surfaces below the horizontal plane approximately 1 meter 40 inches above the shell-to-bottom joint, including columns, wall plates, piping, pipe supports, bottom plates, and other steel components in this area.

d. INDEPENDENT THIRD-PARTY - Impartial third-party not a part or affiliated with Contractor or subcontractor principal or subsidiary businesses, and not a materials supplier.

e. STRIPE COAT - An additional corrosion protection measure on edges, outside corners, crevices, bolt heads, welds, and other irregular surfaces, including minor surface preparation on sharp edges.

1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Corrective Action Request (CAR) Form

Coatings Work Plan

Inspection Report Form

SD-05, Design Data

Environmental Control System

Use of Door Sheet Access Way; G[, [_____]]

SD-06 Test Reports

Coatings Qualification Test Reports

Joint Sealant Qualification Test Reports

Non-Metallic Abrasive Qualification Test Reports; G[, [_____]]

Ferrous Metallic Abrasive Qualification Test Reports

Coating Field Test Reports

Abrasive Field Test Reports

Recycled Ferrous Metallic Abrasive Field Test Reports (Daily and Weekly)

Daily Inspection Reports

SD-07 Certificates

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coatings Inspection Company

Qualifications of Quality Assurance Coatings Inspector

Qualifications of Coatings Contractors

Qualifications of Individuals Performing Abrasive Blasting

Qualifications of Individuals Applying Coatings

Qualifications of Testing Laboratory for Coatings

Qualifications of Testing Laboratory for Abrasive

Coating Materials Certificate of Conformance

Joint Sealant Materials Certificate of Conformance

Joint Sealant Compatibility

Non-Metallic Abrasive Certificate of Conformance

Ferrous Metallic Abrasive Certificate of Conformance

SD-08 Manufacturer's Instructions

Joint Sealant Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive; G[, [_____]]

Inspection Logbook; G[, [_____]]

Corrective Action Log; G[, [_____]]

1.4 QUALITY ASSURANCE

1.4.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents the Contracting Officer within 30 days of contract award for all work covered in this Section, other than the work that will not be uncovered until a later date. All such discrepancies must be addressed and resolved, and the Coatings Work Plan modified, prior to beginning the Initial and Follow-Up phases of work. Discrepancies that become apparent only after work is uncovered must be identified at the earliest discoverable time and submitted for resolution. Schedule time (float) must be built into the project schedule at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.4.2 Corrective Action (CA)

CA must be included in the Contractor Quality Control Plan as outlined in Section 01 45 00 QUALITY CONTROL.

1.4.2.1 Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated.

1.4.2.2 Corrective Action Request (CAR) Form

Develop Corrective Action Request (CAR) forms for initiating CA and for tracking and documenting each step. The CAR should be included with the Corrective Action Procedures. A CAR must be initiated by either the Contractor or the Contracting Officer. The Protective Coatings Specialist (PCS) must approve each CAR at the root cause identification stage, the plan for elimination stage, and the close out stage after verification that the root cause has been eliminated.

1.4.2.3 Corrective Action Log

When a CAR is initiated, the Contractor must take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These actions must apply to non-compliance in the work, and to non-compliance in the Quality Control (QC) System. Corrective actions must be appropriate to the effects of the non-compliance encountered. The

corrective action must be documented in a report that is serialized and tracked in the Corrective Action Log until project completion and acceptance by the Contracting Officer. All corrective action reports must be retained in project records. The Corrective Action Log, showing status of each CAR, must be submitted to the Contracting Officer monthly.

1.4.3 Coatings Work Plan

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NOTE: For maintenance painting, add requirement for pre-work determination of the existing surface profile. If paint removal is specified in another Section, such as a blast cleaning prior to inspection or repair, or in the lead removal Section, include this evaluation of existing profile such that the paint removal operation does not create excessive profile.
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NOTE: Choose the options pertaining to the floating pan that apply to the project. The pan must be removed for any significant coating work on the SHELL and ROOF, and for all but minor repairs on the BOTTOM.
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NOTE: If there is a possibility that generating non-detectable soluble salt levels per PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION could cause delays in surface preparation, the Coatings Work Plan must include a section that would provide guidance on the strategy to be pursued should greater-than-zero soluble salt levels be detected.
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NOTE: Ensure coordination between all parties, including the welder, weld inspector, coatings Contractor, Quality Assurance Coatings Inspector, and Coatings Contractor QC Coatings Inspector, on weld preparation and surface profile requirements.
****

The Coatings Work Plan must be considered as part of the Contractor Quality Control Plan as outlined in Section 01 45 00 QUALITY CONTROL.

The Coatings Work Plan must be submitted and approved by the PCS prior to mobilization. The Coatings Work Plan must explain in detail all procedures including, but not limited to, all sequential processes, quality control for each process, quality assurance for each process, and safety considerations. Subsections must include at least the following:

a. Purpose;

b. Introduction[(including the scope of work (SOW) project program)];

c. Safety, fire, and health information;

d. Contractor and worker qualifications with certifications;

e. Project management organization and documents;

f. Timeline in a Gantt chart;

g. Project document references;

h. Reference to all applicable standards (e.g., AMPP, NACE, SSPC, ISO, and ASTM);

i. Coatings manufacturer's supporting documentation;

j. Descriptions and explanations of any exceptions from the coating manufacturer;

k. Coating and blasting equipment, model names, and, if applicable, calibration dates;

l. Containment design and details;

m. Environmental testing;

n. Material delivery, storage, and handling details;

o. Surface preparation[(include procedures for if the pre-existing anchor profile is greater than 100 microns 4 mils as specified in paragraph ABRASIVE BLASTING)];

p. Pre-application test panel validation for field-applied external coating as outlined in SURFACE STANDARD;

q. Coating materials, mixing, application, recoat windows, and coating curing times, if applicable;

r. Coating repairs and rework;

s. Non-conformance;

t. Spent material handling and effluent discharge containment and disposal;

u. Inspection test plan (as outlined in FIELD INSPECTION, and including inspection hold points, both Quality Assurance and Coating Contractor QC Coatings Inspector's responsibilities, and daily documentation and delivery);

v. Instruments and test kits;

w. Soluble salt testing (include procedures that must be used if greater-than-zero soluble salt levels are not able to be removed from the steel surface);

x. Warranty (in writing, signed by the Contractor and the coating manufacturer's representative);

y. Demobilization;

z. PCS and PM approval;

1.4.4 Design Data

1.4.4.1 Environmental Control System

Submit design details of the proposed environmental control system to include ventilation, humidity control, and temperature regulation. Provide calculations for humidity control during separate surface preparation and coating application procedures, ventilation requirements during coating application, and maximum allowable coating application rates to coincide with ventilation. Include basis of design data on local conditions. Provide equipment layout sketches and procedures showing function of each piece of equipment and fail-safe measures. A Certified Industrial Hygienist must approve calculations, work procedures, and personal protective equipment.

1.4.4.2 Use of Door Sheet Access Way

If use of a door sheet access way is desired, submit design drawings and calculations that address all aspects of the door sheet opening in accordance with API Std 653 and API Std 650, including cutting of door sheet, tank stabilization, door sheet replacement, weld testing, and final acceptance. A registered engineer must approve all calculations and procedures prior to submittal for government approval.

1.4.5 Test Reports

1.4.5.1 Coatings Qualification Test Reports

Submit qualification test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be independent laboratories. Samples must have been tested within the last three years.

The purpose of qualification testing is to pre-qualify the coating materials to MIL-DTL-24441. Submit test results for materials in conformance to the requirements of MIL-DTL-24441. Note that this is the same testing that is required for listing on the Qualified Products List (QPL). The coating materials must remain on the QPL for the entire project.

1.4.5.2 Joint Sealant Qualification Test Reports

Submit qualification test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of joint sealant material that will be used on this project. Samples must have been tested within the last three years. Submit results of conformance to ASTM C920.

1.4.5.3 Ferrous Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of SSPC AB 3. Submit test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of each abrasive to be used on the jobsite. Samples must have been tested within the last three years. Note that this testing is for the purpose of pre-qualifying the abrasive.

1.4.5.4 Non-Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of SSPC AB 1. Submit test results from an INDEPENDENT THIRD-PARTY laboratory of representative samples of each abrasive to be used on the jobsite. Samples must have been tested within the last three years. Note that this testing is for the purpose of pre-qualifying the abrasive.

1.4.5.5 Recycled Ferrous Metallic Abrasive Field Test Reports (Daily and Weekly)

Submit test results from an INDEPENDENT THIRD-PARTY laboratory of daily and weekly Quality Control testing required by SSPC AB 2, as modified in paragraph ABRASIVE.

1.4.6 Qualifications

1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY CIH. Submit documentation that the hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. The CIH must remain certified during the entire project, and the Contracting Officer must be notified of any change in certification status within 10 days of the change. If a CIH's certification expires, the hygienist will not be allowed to perform any hygienist functions, and all hygienist work must stop, until the certification is reissued or another CIH is approved. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Provide evidence of experience with hazards involved in industrial coating application work.

1.4.6.2 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY PCS. Submit documentation that specialist is certified by the Association for Materials Protection and Performance (AMPP) (formerly SSPC: The Society for Protective Coatings (SSPC)) as a PCS, including certification number and date of certification/recertification. If the PCS is employed by the same coatings inspection company to which the Quality Assurance Coatings Inspector is employed, this does not violate the INDEPENDENT THIRD-PARTY requirements. The PCS must remain certified during the entire project, and the Contracting Officer shall be notified of any change in certification status within 10 days of the change. If a PCS's certification expires, the PCS will not be allowed to perform any PCS functions, and all coatings work must stop, until the certification is reissued or another PCS is approved. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. The PCS must not be the designated Quality Assurance Coatings Inspector. The PCS's responsibilities are outlined in PROTECTIVE COATINGS SPECIALIST (PCS).

1.4.6.3 Qualifications of Coatings Inspection Company

Submit documentation that the coatings inspection company that will be

performing all quality assurance coatings inspection functions is certified by AMPP to the requirements of SSPC QP 5 prior to contract award. The coatings inspection company that is submitted and approved, must remain and cannot be changed through completion of the contract. The coatings inspection company must remain SSPC QP 5 certified for the duration of the coating work and the Contracting Officer must be notified of any change in certification status within 10 days of the change. If a coatings inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of all scheduled and unannounced on-site audits from AMPP and furnish a copy of all audit reports. The coatings inspection company must not engage in any activities that may conflict with their independence of judgment and integrity in relation to their inspection activities. In particular, they must not be engaged in the manufacture, supply, application, surface preparation, purchase, or maintenance of the applied coating in this project.

1.4.6.4 Qualifications of Quality Assurance Coatings Inspector

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NOTE: Although the Quality Assurance Coatings Inspector may be a certified NACE CIP Level III inspector, the Quality Assurance Coatings Inspector must be a certified QP 5 Level II inspector, with a minimum of a NACE CIP Level II certification, employed by the coatings inspection company.

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Submit documentation that each Quality Assurance Coatings Inspector is employed by the SSPC QP 5 company and is qualified to a minimum certification of NACE CIP Level II. Each inspector must remain employed by the coatings inspection company while performing any coatings inspection functions. The Quality Assurance Coatings Inspector's responsibilities are outlined in QUALITY ASSURANCE COATINGS INSPECTOR'S FIELD RESPONSIBILITIES. The roles of the Quality Assurance Coatings Inspector are in addition to, and distinct from, the role of the QC Coatings Inspector employed by the coatings Contractor.

1.4.6.5 Qualifications of Coatings Contractors

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NOTE: If project involves removal of paint containing hazardous materials, add requirement for SSPC QP 2 certification in section of specification where the hazardous paint removal is specified, generally Section 02 83 00 LEAD REMEDIATION.

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NOTE: Solicitations requiring certification for pre-qualification must point out the existence and location of the certification requirement on the PROJECT INFORMATION FORM. This requirement must be pointed out in the solicitation documents for the "prior to contract award" requirement to be

enforceable. Certification is a special responsibility requirement pursuant to FAR 9.104-2 Special Standards. This is analogous to requiring bidders to have a specified level of experience or expertise and GAO has sustained these types of special requirements.
****

All Contractors and Subcontractors that perform surface preparation or coating application must be certified to both SSPC QP 1 and SSPC QS 1 prior to contract award, and must remain certified while accomplishing any surface preparation or coating application. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status. Notify the Contracting Officer of all scheduled and unannounced on-site audits from AMPP and furnish a copy of all audit reports.

For projects located outside the United States, Guam, and Puerto Rico, the certifications for the coatings Contractor (SSPC QP 1 and SSPC QS 1) can be substituted if the coatings Contractor meets all of the below requirements:

a. ISO 9001 certified;

b. Eight years of experience with industrial coatings;

c. Evidence of recent work that has Contractor Performance Assessment Report System (CPARS) ratings, and other quality/performance ratings, that are equivalent to, or exceed, "Above Average";

d. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating equivalency to SSPC QP 1 and SSPC QS 1 within the last two years.

[e. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating equivalency to SSPC QP 2 within the last two years.

] The coatings Contractors and coatings Subcontractors must be certified to ISO 9001 prior to contract award and must remain so certified for the duration of the project. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status. Notify the Contracting Officer of all scheduled and unannounced on-site inspections from the ISO certifying organization and furnish a copy of all inspection reports.

1.4.6.6 Qualifications of Individuals Performing Abrasive Blasting

Submit name, address, and telephone number of each person that will be performing abrasive blasting. Submit documentation that each blaster is qualified by AMPP to the SSPC C7 Abrasive Blaster Qualification Program or CAS Coating Application Specialist Level 2 Certification Program (Interim Status). Each blaster must remain qualified during the entire period of

abrasive blasting, and the Contracting Officer shall be notified of any change in qualification status within 10 days of the change. If a blaster's qualification expires, the blaster will not be allowed to perform any blasting functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply.

1.4.6.7 Qualifications of Individuals Applying Coatings

Submit name, address, and telephone number of each person that will be applying coatings. Submit documentation that each applicator is qualified by AMPP to the SSPC CAS Coating Application Specialist Level 2 Certification Program (Interim Status) or SSPC C12 Spray Application Certification. Each applicator must remain certified during the entire period of coating application, and the Contracting Officer must be notified of any change in qualification status within 10 days of the change. If an applicator's qualification expires, the applicator will not be allowed to perform any coatings application functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply.

1.4.6.8 Qualifications of Testing Laboratory for Coatings

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY laboratory or laboratories selected to perform testing of coating samples for qualification testing and for field sample testing for compliance with this Section. Submit documentation that the laboratory is regularly engaged in testing of paint samples for conformance with specifications and that the employees performing testing are qualified.

1.4.6.9 Qualifications of Testing Laboratory for Abrasive

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY laboratory or laboratories selected to perform testing of abrasive for compliance with this Section. Submit documentation that the laboratory has experience in testing samples of abrasive for conformance with specifications and that the employees performing testing are qualified.

1.4.6.10 Coating Materials Certificate of Conformance

Provide manufacturer's certification of conformance to MIL-DTL-24441.

1.4.6.11 Joint Sealant Materials Certificate of Conformance

Provide manufacturer's certification of conformance to ASTM C920 and as modified in this Section.

1.4.6.12 Joint Sealant Compatibility

Provide manufacturer's certification that the selected joint sealant is compatible with the epoxy topcoat.

1.4.6.13 Ferrous Metallic Abrasive Certificate of Conformance

Provide manufacturer's certification of conformance that the materials are

currently in conformance with SSPC AB 3 and as modified in this Section, and have been tested within the last three years.

1.4.6.14 Non-Metallic Abrasive Certificate of Conformance

Provide manufacturer's certification of conformance that the materials are currently in conformance with SSPC AB 1 and as modified in this Section, and have been tested within the last three years.

1.4.7 QA and QC Personnel

1.4.7.1 QC Manager

The QC Manager is as defined in Section 01 45 00 QUALITY CONTROL.

1.4.7.2 Protective Coatings Specialist (PCS)

The PCS must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The PCS must approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

The PCS's responsibilities include, but are not limited to, the following:

a. Obtain, review, and understand all project documentation including, but not limited to, this Section, scope of work (SOW) project program, Coatings Work Plan, inspection and testing plan (ITP), and all submittals before the project starts, during the project, and all coatings related re-work;

b. Attend all pre-job coatings meetings (in-person, phone, or virtually);

c. Attend pre-final coatings walk-through (mandatory) and attend final coatings walk-through (as required).

1.4.7.3 Quality Assurance Coatings Inspector

The Quality Assurance Coatings Inspector must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00 QUALITY CONTROL. The Quality Assurance Coatings Inspector must be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities. The Quality Assurance Coatings Inspector must provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system. The requirements for inspection listed in this Section are in addition to the QC inspection and reporting requirements specified in Section 01 45 00 QUALITY CONTROL. The responsibilities of the Quality Assurance Coatings Inspector are defined in QUALITY ASSURANCE COATING INSPECTOR'S FIELD RESPONSIBILITIES. These responsibilities are separate and distinct from the responsibilities of the Coatings Contractor QC Coatings Inspector.

1.4.7.4 Coatings Contractor QC Coatings Inspector

The Coatings Contractor QC Coatings Inspector must stop non-compliant work. The responsibilities of the Coatings Contractor QC Coatings Inspector are defined in COATINGS CONTRACTOR QC COATINGS INSPECTOR'S FIELD RESPONSIBILITIES. These responsibilities are separate and distinct from the

responsibilities of the Quality Assurance Coatings Inspector.

1.4.8 Pre-Application Meeting

After approval of submittals, but prior to the initiation of coatings work, Contractor representatives, including at a minimum, project superintendent, QC manager, paint foreman, Quality Assurance Coatings Inspector, and PCS, must have a pre-application coating preparatory meeting. This meeting must be in addition to the pre-construction conference. Specific items addressed must include: corrective action requirements and procedures, coatings work plan, safety plan, coordination with other Sections, inspection standards, inspection requirements and tools, test procedures, environmental control system, and test logs. Notify Contracting Officer at least ten days prior to meeting.

1.5 PRODUCT DATA

1.5.1 Joint Sealant Instructions

Submit manufacturer's printed instructions including detailed mixing and application procedures, minimum and maximum application temperatures, and curing procedures. Include Safety Data Sheets (SDS) for materials to be used at the job site in accordance with 29 CFR 1926.59.

1.5.2 Coating System Instructions

Submit manufacturer's printed instructions including detailed mixing and application procedures, number and types of coats required, minimum and maximum application temperatures, and curing procedures. Include Safety Data Sheets (SDS) for materials to be used at the job site in accordance with 29 CFR 1926.59.

1.6 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with SSPC PA 1, and as modified in this Section. Maintain temperature in storage spaces between 5 and 24 degrees C 40 and 75 degrees F, and air temperature more than 3 degrees C 5 degrees F above the dew-point at all times. Inspect materials for damage prior to use and return non-compliant materials to manufacturer. Remove materials with expired shelf life from government property immediately and notify the Contracting Officer.

If materials are approaching shelf life expiration and an extension is desired, samples must be sent to the manufacturer, along with complete records of storage conditions, with a request for shelf life extension. If the manufacturer finds the samples and storage data suitable for shelf life extension, the manufacturer must issue an extension, referencing the product evaluation and the review of storage records. Products must not be extended longer than allowed in the product specification.

1.7 COATING HAZARDS

****
NOTE: This specification Section must be used with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.
****

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or

improperly handled. The coating manufacturer's written safety precautions must be followed throughout mixing, application, and curing of the coatings. During tank cleaning, cleanup, surface preparation, and paint application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in 29 CFR 1910.1000. Comply with respiratory protection requirements in 29 CFR 1910.134. The CIH must approve work procedures and personal protective equipment.

1.8 WORK SEQUENCE

****

NOTE: Modify tank construction specification to indicate that floating pan will be installed over coated bottom and that the coating must be fully protected during pan installation with protective mats. Any required repairs must be done according to paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING.

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[Coat tank interior following tank tightness testing.] [Coat tank interior before installation of floating pan.]

1.9 JOB SITE REFERENCES

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NOTE: Include any other job-site-related references that might be added during design.

****

Make available to the Contracting Officer at least one copy each of API Std 653, ASTM C920, ASTM D3276, ASTM D3925, ASTM D4285, ASTM D4417, ASTM D4940, NACE SP0178 and companion visual comparator, NACE SP0188, SSPC AB 1, SSPC AB 2, SSPC AB 3, SSPC SP COM, SSPC SP 1, SSPC SP 10/NACE No. 2, SSPC SP 11, SSPC PA 1, SSPC PA 2, SSPC Guide 12, SSPC VIS 1, SSPC QP 1, [SSPC QP 2,]SSPC QS 1, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 COATING SYSTEM

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NOTE: Include bracketed text for new construction only.

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Coating systems must be as specified herein; alternate systems will not be considered. All primer, intermediate, and topcoat materials must be manufactured by one manufacturer and supplied by one supplier.[The entire coating system is intended to be applied in the field. Alternatively, surface preparation may be accomplished in the shop, following all temperature, humidity, and testing requirements listed herein, followed by an application of a hold-primer. Upon completion of field fabrication, all shop-applied coatings must be removed, surfaces prepared to SSPC SP 10/NACE No. 2, and the specified coating system applied. Adjust all shop preparation to avoid conflicts with final surface preparation requirements.]

2.1.1 Epoxy Primer, Intermediate, and Topcoats

The epoxy coating materials must be approved by the Naval Sea Systems Command and listed on their current Qualified Products List (QPL) for the specified materials.

2.1.1.1 Epoxy Primer Coat

Epoxy polyamide, MIL-DTL-24441/29 (Formula 150, Type IV, Green).

2.1.1.2 Epoxy Intermediate Coat

Epoxy polyamide, MIL-DTL-24441/31 (Formula 152, Type IV, White (Tinted)). Tint to approximately SAE AMS-STD-595A color number 27778 parchment using pigment dispersions prepared for epoxy paint tinting. Manufacturer shall tint material and appropriately label. All other requirements of this Military Specification apply.

2.1.1.3 Epoxy Topcoat

Epoxy polyamide, MIL-DTL-24441/31 (Formula 152, Type IV, White).

2.2 JOINT SEALANT

Industrial grade, two component, minimum 95 percent solids by volume, polysulfide type caulking material that has a minimum history of 10 years acceptable service in fuel tanks. Sealant must be compatible with the coating and suitable for direct application to prepared steel surfaces. Sealant must contain no more than 0.06 percent by dry weight lead, no more than 0.06 percent by dry weight cadmium, and no chromium. Joint sealant must be qualified to ASTM C920, Type M, Grade NS or P.

2.3 COATING FIELD COLLECTION KIT

Provide a kit for each sample to be collected. Each kit must contain: a one liter quart can for the base of the coating material; one appropriately sized can for the activator of the coating material; dipping cups for each component to be sampled; a shipping box sized for the samples to be shipped; and packing materials. Mark cans for the appropriate coating material and component (base or activator), including manufacturer's name, address, batch numbers, batch size shipped to the project site, and date of manufacture. Provide shipping documents, including either pre-paid shipping labels or a shipping number that can be used by the QC Manager to arrange pickup, addressed to the INDEPENDENT THIRD-PARTY coating testing laboratory.

2.4 ABRASIVE FIELD COLLECTION KIT

Provide a kit for each sample to be collected. Each kit must contain one suitable plastic bag or container for each sample to be collected. Mark containers with manufacturer's name, address, batch number, batch size, and date of manufacture. Provide shipping documents, including either pre-paid shipping labels or a shipping number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.5 INSPECTION TEST KITS

2.5.1 Test Kit for Measuring Chloride, Sulfate, and Nitrate Ions on Steel and Coated Surfaces

Provide test kits that meet all of the following requirements:

a. Contains all materials,supplies, tools, and instructions for field testing and on-site quantitative evaluation of chloride, sulfate, and nitrate ions;

b. Extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;

c. Components and solutions are mercury free and environmentally friendly;

d. Contains new materials and solutions for each test extraction;

e. Contains an extraction test container (vessel, sleeve, cell) creates a sealed, encapsulated environment during salt ion extraction;

f. Contains a test extract container is suitable for testing the following steel surfaces: horizontal (up/down configuration), vertical, flat, curved, smooth, pitted, and rough;

g. All salt ion concentrations are directly measured in micrograms per square centimeter.

2.5.2 Test Kit for Measuring Chlorides in Abrasives

Provide test kits that meet all of the following requirements:

a. Is a completely self-contained test kit with all materials, supplies, tools, and instructions to take tests and identify results;

b. Uses identifiable, consistent, factory pre-measured test extract solution;

c. Provides for testing equal volumes of abrasive and test solution;

d. Provides for taking direct measurements of the chloride ion in parts per million (PPM), without using conversion charts or tables;

e. Provides all new components for extraction and titration for each test;

f. Provides a factory sealed titration device for each test;

g. Uses the extract sampling container as the titration container.

2.5.3 Test Kit for Identifying Amine Blush on Epoxy Surfaces

Provide test kits that meet all of the following requirements:

a. Is a completely self-contained field test kit with all materials, supplies, tools, and instructions to perform tests and indicate the presence of unreacted amines;

b. Uses an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;

c. Contains no mercury or lead and is environmentally friendly;

d. Contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution;

2.6 ABRASIVE

Use abrasive that is specifically selected to provide a sharp, angular profile to the specified depth. Abrasive must meet all requirements of this Section each time that it is placed in the blast pot. A maximum limit for soluble salt contamination (chloride) is specified herein; however, this maximum level of contamination does not guarantee that contamination will not be transferred to the steel surface during abrasive blasting. Other factors, such as on-site handling and recycling, can allow contamination of abrasive that can be transferred to the steel surface. Contractors are cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of contamination in abrasive does not negate the final acceptance testing of steel surfaces.

****
NOTE: The following paragraph is mandatory for all NAVFAC PAC projects. All other agencies may use it after checking applicability.
****

[Abrasive material used must contain a maximum of one percent by weight of any toxic substance listed in either Table Z-1, Z-2, or Z-3 of 29 CFR 1910-SUBPART Z, with the exception of inert or nuisance dust materials, arsenic, beryllium, cadmium, cobalt, lead, mercury, rhodium, silver, tellurium, thallium, and uranium.

] **********
NOTE: Reduce allowable gross gamma radioactivity to 5 picocuries per gram for all NAVFAC PAC projects. Reduce in other areas if states or localities require.
****

[Gross gamma radioactivity must not exceed 5 picocuries per gram.

]2.6.1 Ferrous Metallic Abrasive

2.6.1.1 New and Remanufactured Steel Grit

New and remanufactured steel grit abrasive must conform to the chemical and physical properties of SSPC AB 3 Class 1 (Steel) only; Class 2 (Iron) abrasive must not be used. Modify the requirements of SSPC AB 3 to substitute the requirement in paragraph 4.2.2 CONDUCTIVITY for one chloride test as measured using the test kit described in this Section (paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES). The maximum allowable chloride content is 25 parts per million (PPM).

To develop a suitable work mix from new steel abrasive, a minimum of 200 to 400 recycles is required; therefore, it may be advantageous for a Contractor to use remanufactured steel grit or grit reclaimed from a previous project. Such grit must be traced to new grit conforming to SSPC AB 3 Class 1 and it meets all cleanliness requirements of SSPC AB 3

Class 1 when brought to the current jobsite. Submit one representative sample of this work mix to the INDEPENDENT THIRD-PARTY laboratory for testing, along with samples of new material. Acceptance and use of this work mix must not be used to justify any deviation from surface preparation requirements.

2.6.1.2 Recycled Steel Grit

Recycled steel grit abrasive media must conform to the chemical and physical properties of SSPC AB 2 except that:

a. The maximum allowable chromium and cadmium content of the work mix must be 0.1 percent by weight when tested in accordance with ASTM D3718 for chromium and ASTM D3335 for cadmium. Modify the requirements of SSPC AB 2 to add requirement for one chromate test and one cadmium test for each "LEAD" test required.

b. The maximum allowable chloride content is 25 parts per million (PPM) as measured with the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES. Modify the requirements of SSPC AB 2 to substitute requirement for one chloride test for each "WATER SOLUBLE CONTAMINANTS" test.

2.6.2 Non-Metallic Abrasive

Non-metallic abrasive must be graded to the appropriate surface profile range and must conform to the chemical and physical properties of SSPC AB 1, Class A except that:

a. The maximum allowable chromium and cadmium content of the work mix must be less than 0.1 percent by weight when tested in accordance with ASTM D3718 for chromium and ASTM D3335 for cadmium.

b. Must contain less than 7 PPM chlorides when tested with the kit provided in paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES.

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coatings Work Plan. The Coatings Work Plan must be submitted and approved by the PCS prior to mobilization, in accordance with the paragraph COATINGS WORK PLAN.

[3.1 REMOVAL OF COATINGS CONTAINING HAZARDOUS MATERIALS

****

NOTE: Include Section 02 83 00 LEAD REMEDIATION in any project specification that requires removal or disturbance of coating containing hazardous materials in conjunction with a coating project. Include a contractor qualification requirement similar to the article entitled "Qualifications of Coatings Contractors" in Part 1 of this Section, except that the contractor must be qualified to SSPC QP 2, Category A. Coatings containing hazardous materials can be removed and the new coating applied can be accomplished in a continuous operation if the contractor provides appropriate coordination of removal, cleaning, and coating application. It is

specified as two separate operations to allow separate contractors to accomplish different phases of the project. With the use of SSPC QP 1 and QP 2 requirements in contracts, the same contractor will generally be accomplishing both phases of the work, and will probably want to perform both phases as a single operation to avoid preparing the surfaces twice. To accomplish the coating removal and recoating in a continuous operation, the contractor's plan must be scrutinized for appropriate controls on the removal process, and on the surface preparation/coating application process. Delete this paragraph if no paint containing hazardous material is to be removed.
****

Coatings containing hazardous materials and identified for disturbance during surface preparation, including removal, must be handled in accordance with Section 02 83 00 LEAD REMEDIATION. Coordinate surface preparation requirements from Section 02 83 00 LEAD REMEDIATION with this Section.

][3.2 DOOR SHEET ACCESS WAY

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NOTE: Tanks must be evaluated during inspection and design for appropriateness of cutting out a door sheet. If there is a reason not to allow a door sheet to be cut into a particular tank, delete this paragraph and the related paragraph in Part 1.
****

A door sheet may be cut out of a tank to facilitate personnel and equipment access. The door sheet must be removed in accordance with API Std 653 and API Std 650, including all structural, welding, testing, and evaluation requirements. The door sheet must be installed, tested, and accepted prior to commencement of surface preparation. The door sheet and surrounding areas must be surfaced in accordance with Section 4 of NACE SP0178, and accompanying Visual Comparator, to the condition described and shown for NACE Weld Surface Preparation Designation "C" welds for interior surfaces and "D" Welds for exterior surfaces. The Contractor is responsible for cutting out the door sheet, stabilizing the tank or openings while the door sheet is out, replacing the door sheet, and testing the replaced door sheet using qualified engineering and testing services. Perform tank tightness testing before surface preparation where a door sheet access way was installed for this project. Hydrostatic testing must be performed prior to commencement of surface preparation.

]3.3 FIELD SAMPLE COLLECTION AND TESTING

Sample and test materials delivered to the jobsite as required in TEST REPORTS and subsequent subparagraphs. Notify the Contracting Officer three days in advance of sampling. The QC Manager, and either the PCS or Quality Assurance Coatings Inspector, shall witness all sampling.

3.3.1 Coating Field Sample Collection

Coatings that are on the MIL-DTL-24441 QPL require one sample to be

collected. This sample must be collected and set aside for the duration of the project, and must be tested if unforeseen coatings issues arise or if testing is requested by the Contracting Officer. Coatings that are not on the MIL-DTL-24441 QPL require a random field sample from each lot of coating material used on-site in accordance with ASTM D3925. Each random sample must be tested.

For sampling, utilize sample collection kits as outlined in the paragraph COATING FIELD SAMPLE COLLECTION KIT. Each sample must consist of one liter quart sample of each batch of each base material, and a sample of the activator that is proportional to the mix ratio of the coating type. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly selected and shipped to the INDEPENDENT THIRD-PARTY laboratory, observing all requirements for witnessing and traceability. For purposes of quality conformance inspection, a lot is defined as that quantity of materials from a single, uniform batch produced and offered for delivery at one time. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. If testing is required, the QC Manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and ship one complete sample of each material in question (including base and activator) with all batch information to the INDEPENDENT THIRD-PARTY laboratory for testing as required in paragraph COATING FIELD TESTING REPORTS.

3.3.2 Abrasive Field Sample Collection

Utilize the sample collection kits as required in paragraph ABRASIVE FIELD SAMPLE COLLECTION KIT to obtain samples from each lot of abrasive delivered to site using the sampling techniques and schedule of one sample per every 50 bags for ferrous metallic abrasive, paragraph 4 REQUIREMENTS FOR RECYCLED WORK MIX ABRASIVES of SSPC AB 2 for recycled ferrous metallic abrasives, or paragraph 5.3 SAMPLING FOR QUALITY CONTROL TESTS of SSPC AB 1 for non-metallic abrasives.

For purposes of quality conformance inspection, a lot must consist of all abrasive materials of the same type from a single, uniform batch produced and offered for delivery at one time. The addition of any substance to a batch must constitute a new lot. Identify samples by designated name, specification number, lot number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing required in paragraph ABRASIVE FIELD SAMPLE TEST REPORTS.

3.3.3 Coating Field Test Reports

Submit test results for each sample that requires testing in paragraph COATING FIELD SAMPLE COLLECTION. Test samples of primer, intermediate, and topcoat materials for compliance with requirements of MIL-DTL-24441. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.3.4 Abrasive Field Test Reports

Submit test results for each lot of abrasive delivered to the jobsite. Test samples of ferrous metallic abrasive to the requirements of paragraph 5.2 TEST PARAMETERS of SSPC AB 3, excluding paragraph 5.2.4 DURABILITY. Test samples of recycled ferrous metallic abrasives to the requirements of paragraph 4 REQUIREMENTS FOR RECYCLED WORK MIX ABRASIVES of SSPC AB 2. Test samples of non-metallic abrasive to the requirements of paragraph 5.3 SAMPLING FOR QUALITY CONTROL TESTS of SSPC AB 1. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

[3.4 FUEL REMOVAL AND TANK CLEANING

Remove fuel and clean storage tanks in accordance with Section 33 01 50.55 CLEANING PETROLEUM STORAGE TANKS.

]3.5 LIGHTING

Provide lighting for all work areas as prescribed in SSPC Guide 12.

3.6 ENVIRONMENTAL CONDITIONS

3.6.1 Tank Containment

****
NOTE: Delete this requirement where exterior containment is not required. Containment aids in maintaining environmental conditions by moderating extreme conditions.
****

Maintain exterior tank containment in full working condition during interior surface preparation, coating application, and initial curing to aid in maintaining interior environmental conditions.

3.6.2 Control System Requirements

Provide and utilize dehumidification and ventilation equipment to control humidity, temperature, and vapor levels in tank from beginning of abrasive blasting through coating application and for four days after the last coating is applied. System must maintain vapor concentrations at or below 10 percent of Lower Explosive Limit (LEL). System may incorporate any combination of solid desiccant and direct expansion refrigeration equipment. No liquid, granular, calcium chloride, or lithium chloride drying systems will be accepted. Use only electric, indirect fired combustion, indirect friction, or steam coil auxiliary heaters. System must be compatible with removal of dust and solvent vapors, and must have fail-safe measures to ensure reliability during operations.

3.6.2.1 Automated Monitoring Requirements

Provide continuous monitoring of dehumidification equipment, temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. This data does not suffice for documentation of conformity to surface conditions during application and cure of coating. Locate sensors to provide pertinent data for the surface preparation and coat application being performed. Describe the location plan, including required moves, in

the Coatings Work Plan. Provide monitoring equipment to perform as follows:

a. Data is collected in the field unit in 15-minute increments and available for download (on-site) in a standard database format. Contractor must collect these data and make available to the Contracting Officer, Quality Assurance Coatings Inspector, and QC Manager;

b. Monitoring equipment must have backup power such that data collection will be uninterrupted during the entire period of the dehumidification requirement;

c. Monitoring equipment must have capability to measure surface temperatures at a minimum of four locations anywhere on a structure, regardless of the size of the structure;

d. Monitoring equipment must have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and dewpoint temperature (DP);

There is no requirement for connectivity of the monitoring system to control the dehumidification equipment; therefore, any combination of equipment having the required functionality will be accepted.

3.6.2.2 Humidity Control for Surface Preparation and Primer Application

Provide and utilize dehumidification equipment to maintain relative humidity at appropriate level to prevent prepared steel surfaces from corroding at all times during abrasive blasting through primer application. Failure of humidity control system, or failure to maintain proper conditions, during surface preparation stage may allow surface rusting, which will be rejected and require rework. All surfaces to be coated must meet all requirements at time of primer application. Failure of humidity control system during primer application stage will be cause for removal and replacement of all materials applied and cured while conditions were not as prescribed above.

3.6.2.3 Humidity Control for Application of Intermediate and Topcoats and Initial Curing

Provide and utilize dehumidification equipment to maintain relative humidity at the coldest steel surface in tank below 55 percent at all times during coating application, and during the first four days of initial curing after application of topcoat. This measurement is not the same as measuring the relative humidity of ambient air in the tank, and will require either electronic equipment to monitor relative humidity at the steel surface, or complex calculations to convert relative humidity of air in tank to relative humidity at steel surface. An approved alternative method of monitoring dehumidification that requires less sophisticated equipment or calculations is to maintain a minimum dew point depression of 10 degrees C 18 degrees F below coldest steel surface temperature. This is in lieu of specific relative humidity and dew point requirements in this Section. Failure to maintain specified humidity control during this phase will be cause for extension of humidity controlled cure time to ensure four consecutive days at specified relative humidity at steel surfaces. Formation of condensation in coating application stage prior to the indicated dry-hard time will be cause for removal and replacement of all materials contacted by condensation.

3.7 EQUIPMENT USED IN TANK

Equipment used in the tank after surface preparation begins must not leave any oily residue from exhaust or other sources. Internal combustion driven equipment, other than that powered by natural or bottled gas, must not be used.

3.8 SURFACES TO BE COATED

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NOTE: See UFC 3-460-01 for new coating systems and UFC 3-460-03 for coating system repairs for guidance on which interior tank surfaces should be coated.

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NOTE: A "spot repair" is any repair requiring surface preparation to the bare metal surface.

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Prepare and coat interior tank surfaces, including[BOTTOM][, SHELL][, ROOF][spot repair of [_____] spots of [_____] square meters square feet]. Remove interior piping to ensure complete coverage of the bottom and underside of pipe supports.[Do not coat aluminum floating pan.]

3.9 SURFACE PREPARATION

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NOTE: When editing this specification for maintenance coating work for which SSPC-SP WJ-1/NACE WJ-1, SSPC-SP WJ-2/NACE WJ-2, SSPC-SP WJ-3/NACE WJ-3, or SSPC-SP WJ-4/NACE WJ-4 preparation is to be allowed, include note for the contractor to use potable water, monitor the quality of the water, and adjust water quality to assure appropriate surface preparation and final surface requirements. There are many problems that might arise from both dissolved and suspended material. A common occurrence is water with high chlorides, even in potable water, which may leave unacceptable contamination on cleaned surfaces, and must not be suitable for waterjetting.

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Prepare steel surfaces in accordance with SSPC PA 1 and as specified herein.

3.9.1 Abrasive Blasting Equipment

Use abrasive blasting equipment of conventional air, force-feed, or pressure type. Maintain a minimum pressure of 650 kPa 95 psig at nozzle. Confirm that air supply for abrasive blasting is free of oil and moisture when tested in accordance with ASTM D4285. Test air quality at each startup, but in no case, less often than every five operating hours.

3.9.2 Operational Evaluation of Abrasive

Test abrasive for salt contamination and oil contamination as required in SSPC AB 1 for non-metallic abrasives, SSPC AB 2 for recycled ferrous

abrasives, and SSPC AB 3 for ferrous abrasives. Modify the schedule of testing to be daily, at startup, and every five operating hours thereafter.

3.9.3 Surface Standard

Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use as a surface standard. Blast clean one or more 300 mm 1 foot square steel panels as specified in paragraph SURFACE PREPARATION. Record blast nozzle type and size, air pressure at nozzle and compressor, distance of nozzle from panel, and angle of blast to establish procedures for blast cleaning. Measure surface profile in accordance with ASTM D4417, Method C. When the surface standard complies with all specified requirements, seal with a clearcoat protectant. Use the surface standard for comparison to abrasive blasted surfaces throughout the course of work.

3.9.4 Pre-Preparation Testing for Surface Contamination

Perform testing, abrasive blasting, and testing in the prescribed order.

3.9.4.1 Pre-Preparation Testing for Oil and Grease Contamination

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NOTE: When specifying maintenance painting, use a water based, pH-neutral degreaser to avoid damaging existing coating.
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a. Inspect all surfaces for oil or grease contamination using two or more of the following inspection techniques: 1) Visual inspection, 2) WATER BREAK TEST, 3) BLACK LIGHT TEST, and 4) CLOTH RUB TEST. Reject oil- or grease-contaminated surfaces, clean [using a water based, pH-neutral degreaser]in accordance with SSPC SP 1, and recheck for contamination until surfaces are free of oil and grease.

b. WATER BREAK TEST - Spray atomized mist of distilled water onto surface and observe for water beading. If water wets surface rather than beading up, surface can be considered free of oil or grease contamination. Beading of water (water forms droplets) is evidence of oil or grease contamination.

c. BLACK LIGHT TEST - Inspect surfaces for oil and grease contamination using the light specified in the paragraph BLACK LIGHT. Use light no more than 381 mm 15 inches from surface unless testing indicates that the specific oil or grease found in tank fluoresce at a greater distance. Use light in tank that is completely sealed from light infiltration, under a hood, or at night. Any fluorescing on steel surfaces is indication of petroleum oil/grease contamination. Use either WATER BREAK TEST or CLOTH RUB TEST to confirm both contaminated and non-contaminated areas detected by BLACK LIGHT TEST. The BLACK LIGHT TEST must not be used during inspection of prepared surfaces for oil and grease contamination unless proven to fluoresce the oil and grease found in the specific tank and documented during testing prior to abrasive blasting. Generally, only petroleum oil/grease will fluoresce; however, some may not fluoresce sufficiently to be recognized and other methods, such as the WATER BREAK TEST or CLOTH RUB TEST, must be used to confirm findings of the BLACK LIGHT TEST.

d. CLOTH RUB TEST - Rub a clean, white, lint-free, cotton cloth onto the

surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent must be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

3.9.4.2 Pre-Preparation Testing for Soluble Salts Contamination

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NOTE: The testing for chlorides, sulfates, and nitrates (CSN) is especially important if there was evidence of corrosion production or if the bare surface has been contaminated prior to surface preparation.

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Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. This phase is required since pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. The purpose of soluble salts testing prior to surface preparation is to establish a baseline reading. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet, plus one test for each additional 200 square meters 2000 square feet, or part thereof.[Concentrate testing of bare steel at areas of coating failure to bare steel and areas of corrosion pitting.][Perform 30 percent of tests on bare steel at welds, divided equally between horizontal and vertical welds.] One or more readings greater than non-detectable for chlorides, sulfates, or nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as described below, allow to dry, and re-test until all required tests show allowable results. Re-blast tested areas using vacuum equipped blast equipment. Label all test tubes and retain for test verification. Soluble salts testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION as a final acceptance test of prepared surfaces after abrasive blasting, and successful completion of this phase does not negate that requirement. Effective removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water and soluble salts remover. The soluble salts remover shall be acidic, biodegradable, non-toxic, non-corrosive, and after application, will not interfere with primer adhesion. Delays between testing and preparation, or testing and coating application, may allow for the formation of new contamination. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting. Test methods and equipment used in this phase are as stated in the Coatings Work Plan.

3.9.5 Abrasive Blasting

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NOTE: The issue of maximum profile on new structures is an important one. Once a profile is established, it is nearly impossible to reduce it; therefore, the initial profile will dictate the profile for the life of the structure.

The specified 2-4 mil surface profile is the preferred depth for preparing for the primer. On steel that was previously prepared to a deeper depth and coated, a depth of 4 mils can be tolerated with

an additional mil of primer thickness.

It is the responsibility of the coatings Contractor to achieve the profile required by properly selecting the appropriate abrasive size. Harder, smaller abrasives can result in lower (shallower) profile depth.

If higher (deeper) pre-existing profile height is anticipated or encountered, both the PCS and the coating manufacturer must provide approval in writing to coat the higher surface profile. The government will not be responsible for the cost of additional coating materials for higher than specified surface profiles. Procedures for coating higher pre-existing surface profiles and gathering specific approvals must be included in the Coatings Work Plan.

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Abrasive blast steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2. Prepared surfaces shall conform to SSPC VIS 1 and shall match the prepared test-panels as specified in paragraph SURFACE STANDARD. Provide a 50 to 100 micron 2 to 4 mil surface profile. Reject profile greater than 100 microns 4 mils, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with ASTM D4417, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 100 square meters 1000 square feet plus one test area for each additional 100 square meters 1000 square feet or part thereof. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean.

[On previously coated and prepared surfaces, determine and establish the average existing surface profile. If the pre-existing surface profile is greater than 100 microns 4 mils, or than what is allowable by the coating system instructions, the contractor must acquire written approval by the manufacturer to utilize a higher anchor profile. The manufacturer's supporting letter must state that the additional profile will not degrade coating performance in any way and will be warranted the same. Abrasive blast the steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2 using abrasive and technique which does not increase the existing profile. Provide a surface profile of at least 100 microns 4 mils but no additional profile than that existing. Reject profile greater than existing, discontinue abrasive blasting, and modify processes and materials to provide the specified agreed existing profile. Prepared surfaces must conform to SSPC VIS 1 and must match the prepared test-panels as specified in paragraph SURFACE STANDARD. Measure surface profile in accordance with ASTM D4417, Method A and Method C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 100 square meters 1000 square feet plus one test area for each additional 100 square meters 1000

square feet or part thereof. Provide two additional measurements for each non-compliant measurement. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean. On previously coated and prepared surfaces, profiles higher than 100 microns 4 mils should be anticipated and these procedures must be included in the Coatings Work Plan.

][For maintenance coating the use of SSPC-SP WJ-1/NACE WJ-1, SSPC-SP WJ-2/NACE WJ-2, SSPC-SP WJ-3/NACE WJ-3, or SSPC-SP WJ-4/NACE WJ-4 preparation is acceptable. Potable water must be used. The quality of the water must be monitored. The water quality must be adjusted to assure appropriate surface preparation and final surface requirements. Water must not contain dissolved or suspended material. High chlorides, even in potable water, can leave unacceptable contamination on cleaned surfaces, and must not be suitable for waterjetting.

]3.9.6 Disposal of Used Abrasive

Dispose of used abrasive off Government property in accordance with Federal, State, and Local mandated regulations.

3.9.7 Pre-Application Testing for Surface Contamination

3.9.7.1 Pre-Application Testing for Oil and Grease Contamination

Ensure tank surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION.

3.9.7.2 Pre-Application Testing for Soluble Salts Contamination

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NOTE: In new tanks, require 30 percent of tests to be accomplished at welds. In tanks that have been in service, corroded areas must be tested for high chlorides.
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NOTE: The testing for chlorides, sulfates, and nitrates (CSN) is especially important if there was evidence of corrosion production or if the bare surface has been contaminated prior to surface preparation.
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Test surfaces for soluble salts contamination using the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDE, SULFATE, AND NITRATE IONS ON STEEL AND COATED SURFACES. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet; plus one test for each additional 200 square meters 2000 square feet; or part thereof.[Concentrate testing of bare steel where areas of coating failure to bare steel and areas of corrosion pitting were located.][Perform 30 percent of tests on bare steel at welds, divided equally between horizontal and vertical welds.] Label all test tubes and retain for test verification. One or more readings greater than non-detectable for chlorides, sulfates, or nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as required in paragraph PRE-PREPARATION

TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show acceptable results. Re-blast tested areas using vacuum equipped blast equipment. An atmospheric event, such as a coastal storm blowing onshore, can bring chloride contamination. Following an atmospheric event, spot testing must be accomplished to verify satisfactory conditions and to avoid intercoat contamination. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

3.9.7.3 Pre-Application Testing for Surface Cleanliness

Apply coatings to dust free surfaces. To test surfaces, use ISO 8502-3. Use a kit that is compliant with ISO 8502-3. If the test does not result in a rating of 2 or better, then reject contaminated surfaces, clean by vacuum cleaning, and retest. Test surfaces at rate of three tests for the first 100 square meters 1000 square feet, plus one test for each additional 100 square meters 1000 square feet, or part thereof. Provide two additional tests for each failed test or questionable test. Document test results in the Daily Inspection Report and attach tape to the Daily Inspection Log.

Ferrous abrasives may become magnetized and difficult to remove from the steel substrate. If ferrous abrasives are used, additional visual inspection must be performed to ensure no surface contamination by the abrasive is present.

3.10 MIXING AND APPLICATION OF COATING SYSTEM AND SEALANT

3.10.1 Preparation of Sealant and Coating Materials for Application

Each of the different products, primer, intermediate, topcoat, and sealant, is a two-component material supplied in separate containers.

3.10.1.1 Mixing

Mix in accordance with coating system instructions, which may differ for each product. Do not mix partial kits unless standardized measuring cups are utilized. Do not alter mix ratios. All mixing processes must be witnessed by the Quality Assurance Coatings Inspector. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time based on its temperature.

3.10.1.2 Pot Life

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Do not add solvent to extend pot life. All required solvent at time of mixing. Pot life is based on standard conditions at 21 degrees C 70 degrees F and 50 percent relative humidity. For every 10 degrees C 18 degrees F rise in temperature, pot life is reduced by approximately half, and for every 10 degrees C 18 degrees F drop, it is approximately doubled. Usable pot life depends on the temperature of the material at the time of mixing and the sustained temperature at the time of application. Other factors such as the shape of the container and volume of mixed material may also affect pot life. In hot climates, pre-cooling or exterior icing of components for at least 24 hours to a minimum of 10 degrees C 50 degrees F will extend pot life. The approximate pot life

time for the epoxy primer and intermediate coat materials is four hours. The approximate pot life time for the sealant materials is as specified by the manufacturer.

3.10.1.3 Application Conditions and Recoat Windows

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NOTE: These requirements are provided in an attempt to prevent the significant number of intercoat delamination failures that are frequently found on industrial structures. The very strict requirements on application conditions and recoat windows may require work during abnormal hours, including weekends. Contractor work hours must allow for such during coating application.

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NOTE: Cold-weather application is not covered by this specification. If a project is designed for coating in cold weather, then the enclosure and heating requirements may be significant. It is not intended that contractors be forced to apply coatings in cold weather; however, the underlying premise is that coatings must be applied within the specified temperature ranges. A cold-weather specification must not be used to simply save money, as the coating system will generally not have the same longevity as one applied within 60-100 degrees F.

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The application condition requirements for the coating system are very time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures.

a. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of primer, STRIPE COAT, intermediate coat, topcoat, and sealant, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating or cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats.

b. Maintain air and steel surface temperature within the range allowable by the manufacturer's PDS during application and the first four hours of cure for each epoxy coat. Maintain steel surface temperature more than 3 degrees C 5 degrees F above the dew-point of the ambient air for the same period. These conditions may require environmental controls through containment.

c. If coating is not applied during recoat window specified by the coating manufacturer, or if surface temperature exceeds the temperature recommended in the manufacturer's PDS between applications, provide GLOSS REMOVAL. If next planned coat is topcoat, apply FILL COAT if required to fill sanding marks. Sanding marks from GLOSS REMOVAL of intermediate coat reflecting through topcoat will be considered as non-compliant. Apply FILL COAT within 24 hours of GLOSS

REMOVAL, then apply topcoat within RECOAT WINDOW of FILL COAT. The topcoat must be free of defects and be of uniform appearance in accordance with SSPC PA 1. Lack of hiding by the finish coat must require additional applications to obtain uniform appearance.

d. FILL COAT - Where indicated, apply coat of intermediate coat epoxy, at 50 to 75 microns 2 to 3 mils DFT, then apply next specified full coat within recoat window of FILL COAT. A FILL COAT may be used to adjust coating thickness to comply with requirements or to fill sanding marks in intermediate coat.

e. GLOSS REMOVAL - Where required, hand sand in a circular fashion to remove gloss using 120-200 grit wet/dry sandpaper, followed by solvent wiping with a clean rag soaked with denatured alcohol to remove all dust. GLOSS REMOVAL of primer or intermediate coats is to scarify surface. If steel is exposed during GLOSS REMOVAL, repair in accordance with PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. GLOSS REMOVAL of the topcoat may include removal of up to 75 microns 3 mils of coating to avoid excess thickness, prior to application of FILL COAT.

3.10.2 Amine Blush Testing of Epoxy Coat Prior to Overcoating

Test epoxy surfaces prior to application of each epoxy coat or sealant for amine blush contamination using the test kit described in paragraph TEST KIT FOR IDENTIFYING AMINE BLUSH ON EPOXY SURFACES. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet, plus one test for each additional 200 square meters 2000 square feet, or part thereof. If one or more tests show positive results for amine blush contamination, either treat all surfaces using the approved amine blush removal procedure or increase testing to ensure that all contamination is located, and then treat identified contamination using the approved procedure.

3.10.3 Application of Coating System and Joint Sealant

Apply coatings in accordance with SSPC PA 1, SSPC PA Guide 11 and as specified herein. Apply coatings and sealant to surfaces that meet all stated surface preparation requirements.

a. Apply each coat in a consistent wet film, at 90 degrees to previous coat. Ensure that primer and intermediate overlaps are no less than 150 mm 6 inches from welds. Apply STRIPE COAT by brush, working the material into corners, crevices, pitted areas, and welds, and onto outside corners and angles. For convenience, STRIPE COAT material may be delivered by spray if followed immediately with brush-out and approved procedures include appropriate controls on thickness. Apply all other coats by spray application. Use appropriate controls to prevent airborne coating fog from drifting beyond [[3][_____] meters [15][_____] feet from the tank perimeter] [the tank berm]. The cleanliness, temperature, recoat windows, and airborne paint containment requirements may necessitate the use of portable shelters or other appropriate controls.

b. After application of primer coat, and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION to ensure minimal intercoat contamination. If contamination is detected, wash per SSPC SP 1 and re-inspect. This testing may be reduced to one half of

the prescribed rate for bare steel if the testing indicates no contamination when sampling is evenly distributed over surfaces being tested. If contamination is found between coats, revert to the specified testing rate. Generally, oil and grease contamination and soluble salts contamination are not encountered if subsequent coats are applied within specified recoat windows and the quality of air entering tank is controlled. Spot testing must be accomplished to verify satisfactory conditions and to avoid intercoat contamination. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination or to define extent of contamination for appropriate treatment.

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NOTE: Maximum thickness measurements are to limit internal stresses in each coat and in total system. Internal stresses of epoxy coatings on steel can be significant, and unless limited through thickness, can cause premature failure as the coating ages. Such failures as shrinkage cracking and delamination, either from the substrate or between coats, are common. This system is not expected to receive a maintenance overcoat.

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Apply coatings at the following specified thickness and in the following order:

Coat	Minimum DFT (Microns)	Maximum DFT (Microns)
Primer	75	125
Intermediate	75	125
Top	75	125
Total system	225	375

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Primer	3	5
Intermediate	3	5
Top	3	5
Total system	9	15

Measure coating thickness in accordance with SSPC PA 2 to confirm that coating application is within the specified range and within the tolerances of that standard. For non-compliant areas, increase number of test areas to identify all non-compliant application as required by SSPC PA 2. Add coating as required to correct low DFT areas, and remove coating with excess thickness to bare steel and reapply as specified in PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING.

3.10.3.1 Application of STRIPE COAT

Apply STRIPE COAT of epoxy primer material prior to application of general primer coat on ROOF and SHELL. Apply STRIPE COAT of epoxy intermediate coat material after application of general primer coat on BOTTOM. A STRIPE COAT must be applied to areas where joint sealant will be applied. This application must be consistent with APPLICATION OF COATING SYSTEM AND JOINT SEALANT. The STRIPE COAT must be in a contrasting color to the to preceding and subsequent coats and extend a width of no less than 38 mm 1.5 inches on each side of the feature being protected.

3.10.3.2 Application of Primer

Apply primer coat within recoat window of STRIPE COAT.

3.10.3.3 Application of Intermediate Coat

Apply intermediate coat within recoat window of primer coat.

3.10.3.4 Application of Topcoat

Make all required repairs to primer and intermediate coats as specified in PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING prior to applying topcoat. Apply topcoat within recoat window of intermediate coat. Consult manufacturer for application procedures for anticipated temperature and humidity conditions. Touch-up blemishes and defects within recoat window of epoxy topcoat.

3.10.3.5 Application of Joint Sealant

After a full coating system has been installed, holiday tested, and repaired as necessary, apply sealant to the roof-to-shell joint, to all roof plate lap joints, and to roof-to-rafter joints up to 25 mm 1 inch gap to exclude moisture from these marginally prepared crevice areas.

3.10.4 Holiday Testing

When the coating is dry to handle, but before the joint sealant is applied, perform holiday testing in accordance with the low voltage wet sponge method of NACE SP0188. Dry to handle is defined as curing to the degree that the surface will not be marred or damaged by normal foot traffic. Repair holidays per PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING.

3.10.5 Tank Occupancy After Coating Application

Verify the coating has reached a cured state that will allow foot traffic. Use clean canvas, or other approved, shoe covers when walking on coated surfaces, regardless of curing time allowed. Provide cushioned mats for all traffic areas.

3.10.6 Procedure for Holiday and Spot Repairs of Newly Applied Coating

Repair coating film defects at the earliest practicable time, and before application of the succeeding coat. Any holiday found must have a STRIPE COAT applied in the area prior to application of the finish coat. Observe all requirements for soluble salts contamination, cleanliness between coats, and application conditions. Prepare defective area in accordance

with SSPC SP 10/NACE No. 2, and feather coating as required to leave 100 mm 4 inches of each succeeding coat feathered and abraded. If spot repair locations are less than 0.5 percent of the surface area and no greater than 150 mm 6 inches in diameter, prepare surface to SSPC SP 10/NACE No. 2 vacuum blasting or SSPC SP 11 using an impact tool to create an acceptable profile. Do not abrade the epoxy topcoat. Protect adjacent areas from damage and overspray. Remove dust and solvent wipe the prepared area plus an additional 100 mm 4 inches beyond the prepared area with clean denatured alcohol. Apply each coat within recoat window of preceding coat. Within four hours of preparation, apply primer to prepared steel and feather onto prepared primer. Apply intermediate coat to primed area and feather to prepared intermediate area. Apply topcoat to intermediate coat and feather to prepared topcoat. Apply each repair coat to approximate thickness of surrounding coating system. If one percent or more of the total surface area, or more than one spot per 200 square meters 2000 square feet, of the BOTTOM area requires repair to any coat or coats, including feathered areas, the entire BOTTOM coating system must be removed and reapplied. The limit on BOTTOM repairs includes repairs made before and after floating pan installation. If 5 percent or more of the total surface area, or more than one spot per 100 square meters 1000 square feet, of the ROOF area requires repair to any coat or coats, including feathered areas, the entire ROOF coating system must be removed and reapplied. Repairs on the SHELL are not limited.

3.10.7 Extended Cure of Coating System Prior to Immersion Service

Allow a cure time of at least 14 days after the final coating material has been applied before introducing water or fuel into tank. [Allow a cure time of 12 days after the final coating material has been applied before beginning installation of the floating pan.]

3.11 PROJECT IDENTIFICATION

At the completion of the tank work, stencil the following information on the exterior of the tank adjacent to the main manway opening in 3/4- to one-inch Helvetica style letters of contrasting color using acrylic stencil paint:

Date Interior coated:
Project Number:
Contractor:
Address:
Coating System
Surface Prep: SSPC SP ____ Profile: _____
Primer: _____ Thickness: ____
Intermediate: _____ Thickness: ____
Topcoat: _____ Thickness: ____
Total Thickness: _____

3.12 FIELD QUALITY CONTROL

Project documentation, including inspection and testing records, must be used to determine the Contractor's compliance with contract requirements and approved procedures. The Contractor's certifications of completion, for both invoices and for project completion, shall be based on documented evidence of compliance with all requirements and approved Coatings Work Plan procedures. Track inspections and tests in the Test Plan & Log.

3.12.1 Field Inspection

3.12.1.1 Inspection and Documentation Requirements

a. Perform field inspection in accordance with ASTM D3276 and the approved Coatings Work Plan.

b. Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:

   (1) Location or area;

   (2) Purpose (required or special);

   (3) Method;

   (4) Criteria for evaluation;

   (5) Results;

   (6) Determination of compliance;

   (7) List of required rework;

   (8) Observations.

c. Collect and record environmental conditions as described in ASTM D3276 on a 24 hour basis, as follows:

   (1) During surface preparation, every hour, or when changes occur;

   (2) During coating application and the first four days of initial cure, every hour, or when changes occur;

   (3) Note location, time, and temperature of the highest and lowest surface temperatures each day;

   (4) Use a non-contact thermometer to locate temperature extremes, then verify with contact thermometers.

d. Data collected on environmental conditions in AUTOMATED MONITORING REQUIREMENTS may be used for overnight data; however, the data must be constantly verified as to location of sensors and validity of data with respect to the coating work being accomplished.

e. Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed. Work documented using data from equipment found to be out of calibration must be considered as non-compliant since last calibration or calibration check, as required.

f. Document Contractors compliance with the Coatings Work Plan.

3.12.1.2 Inspection Report Form

Develop project-specific report forms, as required, to report measurement and test results and observations being complete and compliant with contract requirements. This includes all direct requirements of the contract documents and indirect requirements of referenced documents. Show acceptance criteria with each requirement and indication of compliance of each inspected item. Annotation of non-compliance must be conspicuous so as to facilitate identification and transfer to the Rework Log. Report forms must include requirements and acceptance and rejection criteria, and must be legible and presented so that entered data can be quickly compared to the appropriate requirement. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3.12.1.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework, in accordance with QC procedures of Section 01 45 00 QUALITY CONTROL. Each report must be signed by the Quality Assurance Coatings Inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.12.1.4 Inspection Logbook

A continuous record of all activity related to this Section must use an electronic reporting program as outlined in Table I and be maintained on a daily basis. The computer / software package must be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information including photo documentation where appropriate.

In areas where photography is not allowed, the computer must come with verification that the camera / photo capability has been removed. Alternatively, a continuous record of all activity related to this Section must be maintained in an Inspection Logbook on a daily basis. The logbook must be hard or spiral-bound book or digital program with consecutively numbered pages, and must be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. Submit the original Inspection Logbook to the Contracting Officer upon completion of the of the project and prior to final payment.

3.12.1.5 Inspection Equipment

All equipment must be in good condition, operational within its design range, and calibrated as required by the specified standard for use of each device.

3.12.1.5.1 Black Light

Use a black light having a 365-nanometer intensity of 4,000 microwatts per square centimeter minimum at 380 mm 15 inches.

3.12.2 Coatings Contractor QC Coatings Inspector's Field Responsibilities

The Coatings Contractor QC Coatings Inspector responsibilities include complete documentation of all daily inspection and production activities for the entire coatings project as outlined in the Coatings Work Plan,

scope of work (SOW) project program, and this Section. This includes, but is not limited to, the following:

a. Attending and documenting the pre-job meeting and acquiring the scope of work (SOW) project program, inspection and testing plan (ITP), schedule, and a list of who will receive the QC daily inspection reports;

b. Performing a project site walk-through with the Quality Assurance Evaluator (QAE) or asset owner, Coatings Contractor QC, QC Manager, and Quality Assurance Coatings Inspector, inspecting at least the following:

    (1) Asset(s) to be coated;

    (2) Equipment and placement of equipment;

    (3) Materials delivery and storage;

    (4) Facility operational requirements during the project.

c. Perform all daily and hold point inspections including, but not limited to, the following:

    (1) Check equipment, including blotter test to verify compressed air cleanliness;

    (2) Perform non-visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR SOLUBLE SALT CONTAMINATION and PRE-APPLICATION TESTING FOR SOLUBLE SALT CONTAMINATION);

    (3) Perform visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION and PRE-APPLICATION TESTING FOR OIL AND GREASE CONTAMINATION);

    (4) Obtain environmental readings;

    (5) Perform abrasive field testing per SSPC AB 1, SSPC AB 2, or SSPC AB 3;

    (6) Perform surface preparation monitoring and testing;

    (7) Perform surface cleanliness testing;

    (8) Perform dust quantity testing;

    (9) Record materials storage documentation (record all coating and abrasive materials information, batch numbers, segregation, and storage temperature);

    (10) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;

    (11) Verify, witness, and record application method;

    (12) Perform random wet film thickness (WFT) readings;

    (13) Perform inspection of coatings application;

(14) Obtain dry film thickness (DFT) readings per SSPC PA 2;

(15) Perform holiday testing in accordance with HOLIDAY TESTING;

(16) Observe label asset identification (label stickers);

(17) Write Correction Action Reports (CAR), if needed;

(18) Write Non-Conformance Reports (NCR), if needed.

d. Writing a daily detailed summary of the work shift inspections, testing, and the day's events, including any meetings and prevalent conversations. The final daily report must include a project summary that must be part of the last daily coatings inspection report.

e. The Coatings Contractor QC Coatings Inspector must stop all non-compliant work.

3.12.3 Quality Assurance Coatings Inspector's Field Responsibilities

The Quality Assurance Coatings Inspector's field responsibilities include complete documentation of all on-site work associated with the coatings project. These responsibilities include, but are not limited to, the following:

a. Attending and documenting the pre-job meeting and acquiring the scope of work (SOW) project program, ITP, schedule, and a list of who will receive the QC daily inspection reports;

b. Performing a project site walk-through with the QAE or asset owner, prime Contractor, and coatings Contractor (QC Coatings Inspector and QC Manager), inspecting at least the following:

(1) Asset(s) to be coated;

(2) Equipment and placement of equipment;

(3) Materials delivery and storage;

(4) Facility operational requirements during the project.

c. Verifying all daily and hold point inspections performed by the Coatings Contractor QC Coatings Inspector or QC Manager by performing mirror inspections including, but not limited to, the following:

(1) Verify equipment check, including blotter test to verify compressed air cleanliness;

(2) Verify visible contaminants testing;

(3) Take environmental readings;

(4) Perform surface preparation monitoring and testing;

(5) Perform surface cleanliness testing;

(6) Perform dust quantity test;

(7) Record materials storage documentation (record all coating and

abrasive materials information, batch numbers, segregation, and storage temperature);

(8) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;

(9) Verify, witness, and record application method;

(10) Inspect coatings application;

(11) Perform dry film thickness (DFT) readings per SSPC PA 2;

(12) Inspect asset identification (label stickers);

(13) Write Correction Action Reports (CAR), if needed;

(14) Write Non-Conformance Reports (NCR), if needed.

d. The following testing is witnessed by the Quality Assurance Coatings Inspector and performed by the Coatings Contractor QC Coatings Inspector or QC Manager:

(1) Wet film thickness (WFT) readings by coatings applicator(s);

(2) Non-visible contaminants testing for chlorides, sulfates, and nitrates (CSN);

(3) Abrasive field testing per SSPC AB 1, SSPC AB 2, or SSPC AB 3;

(4) Holiday testing.

e. Writing a daily detailed summary of the work shift inspections, testing, and the day's events, including any meetings and prevalent conversations. The final daily report must include a project summary that will be part of the last daily coatings inspection report.

3.13 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. Remove all foreign matter such as blast media, dust, dirt, debris, grease, and oils. Wipe all dry to handle coated surfaces with damp lint-free cloth. Remove temporary connections to Government- or Contractor- furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

Table I
QA/QC Reporting Program Requirements

Administrative Controls:

Administrators must be able to turn on and off unique access to specific jobs and contracts.

Administrators must be able to remotely enable and disable access for users.

Administrators must be able to associate contract specific documents and specification limits quickly and easily.

Administrators must be able to associate PDS, SDS, blueprints, scope of work, and contracts uniquely to each job.

Objectivity Controls:

Data entry fields must be by multi-selectable choices, numeric keypads, pickers and skip logic to ensure repeatable data entry in a way that makes running analytics and metrics easy and objective.

Retrievable storage must be provided for all job-related reports and documents for a minimum time of five years from completion of the job or project. Archiving of the documents after five years will be the responsibility of the Government.

Document Library:

All reports must be in searchable and annotatable Portable Document Format (PDF).

Annotations and modifications must be locked and associated with the document. Only the Administrator has rights to modify or delete annotations or allow modifications to the document library especially all related inspection reports.

Customization:

The program must be capable of being customized to specific jobs, contracts or specifications.

-- End of Section --