UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2016
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DIVISION 09 - FINISHES

SECTION 09 97 13.27

EXTERIOR COATING OF STEEL STRUCTURES

02/16

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USACE / NAVFAC / AFCEC / NASA | **UFGS-09 97 13.27 (February 2016)**

Preparing Activity: NAVFAC | **Superseding UFGS-09 97 13.27 (February 2010)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 09 97 13.27

EXTERIOR COATING OF STEEL STRUCTURES
02/16

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NOTE: This guide specification covers the requirements for a Non-Zinc Epoxy Barrier Coating, Flexible/Fluoropolyurethane coating systems, VOC Compliant <50 grams per liter .42 lbs per gal max. VOC. These products were developed under NAVFAC SBIR (Small Business Innovative Research & Development grants) in 2005 & 2006 under Contract Numbers N68711-05-P-0039, N68711-05-P-0043 Phase I and N62473-06-C-3051, N62473-06-C-3038 Phase II. Their use is for exteriors of new steel structures, such as fuel tanks, water tanks, aboveground piping and hangar walls. This system is also for operations involving the removal and replacement of existing coating systems for exterior steel.

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 items(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)**.**

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NOTE: Updates to this specification should be edited or reviewed by a SSPC certified Protective Coatings Specialist (PCS) that has five or more years of experience preparing coating specifications.

The designer must not alter the products or processes specified herein without thorough

knowledge of the need for the changes and the implications of those changes. Use of alternate coating systems must be justified by evaluating lifecycle costs using 50 year life as a baseline.
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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 guide specification is intended for coating of new structures and coating of existing structures where all existing coating material is being removed to bare metal. To determine the requirements for maintenance of an existing coating, a coating inspection or coating condition survey (CCS), as described herein, should be accomplished prior to designing the coating project. Without a competent inspection, there is no reliable way to determine the type or condition of the existing coating system. Without knowing the existing conditions, proper (effective and financially supportable) surface preparation or coating system selection cannot be made.
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NOTE: This specification is for general use on steel structures, or miscellaneous steel appurtenances, in atmospheric service (non-immersion). This includes fuel tanks, water tanks, aboveground piping, cranes, towers, hangars. It should also be used for enclosed or exposed structural steel in buildings such as hangars, acoustical enclosures, or other facilities where a high-performance coating system is desired. The repair of galvanizing will still require the use of a zinc-rich primer, followed by the application of the general coat of Non-Zinc Epoxy Barrier Coating, Flexible and Fluoropolyurethane topcoat to all surfaces.
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NOTE: This specification is for a 2 coat Field Applied system. Applied coating system is compliant with EPA VOC regulations as of June 2000.

All coatings comply with 50 grams per liter .42 lbs. per gal. max.VOC.
- Non-Zinc Epoxy Barrier Coating, Flexible <50 grams per liter .42 lbs per gal max. VOC
- Fluoropolyurethane Topcoat <50 grams per liter .42 lbsper gal max. VOC

The designer must review state and local, regulations and determine whether the coating in

this Section complies with restrictions on volatile organic components (VOC) and other chemical constituents.
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NOTE: Previous versions of this specification have included a requirement for surfaces to be abrasive blasted to SSPC 7/NACE No.4, inspected, and repaired, prior to coating. That requirement has been removed from this specification, and if required for a repair project, it should be included in the structural repair Section of the project specification. Tailor the paragraph 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 13.13 STEEL TANKS WITH FIXED ROOFS.
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NOTE: For purposes of this specification, the term "maintenance coating" refers to maintenance overcoating as opposed to complete removal of coatings and recoating. For maintenance coating designs, or to determine if maintenance overcoating is appropriate, a coating condition survey (CCS) should be accomplished. The CCS should be accomplished by personnel from a business that routinely performs coating evaluations, and the individual investigator should be Certified by SSPC as a Protective Coatings Specialist. The CCS should be sufficiently detailed to provide all technical information about the coatings, and structures to be coated, required to properly design the project. At a minimum, the CCS should provide a detailed report of:

1. Existing coating conditions, including condition of coating film, and the existence of potentially hazardous substances that may impact coating management (i.e. lead, cadmium, chromium);

2. Analysis of remaining coating life, suitability of overcoating, and technical requirements for overcoating;

3. Technical recommendations for the most cost effective management of existing coating systems, including any hazardous materials present in paint film; and

4. Any other information of interest to the coating

system management that should be identifiable by an individual trained and experienced in the field of coating analysis, coating failure analysis, and coating design.

The scope of the CCS should be tailored to the specific project, and it should be recognized that while multiple coating failures or deficiencies may look similar to the untrained eye, the risks of generalizing to save evaluation costs are potentially very high. The cost of large-scale failure of the overcoating, and complete replacement of the coating system, is far more than the cost of a CCS for all but the smallest projects.

The risks of overcoating can usually be avoided by designing project to remove all existing coatings to bare metal, then providing appropriate surface preparation and coating application. However, the extra costs of the coating removal, especially if containing hazardous material, along with the cost of surface preparation to SSPC SP 10 Abrasive Blast to Near-White Metal, may be exorbitant compared to the costs of maintenance overcoating where the existing coating system is in fair-to-good condition.

Additionally, NAVFAC Design Policy Letter DPL-09B-0001, Lead-containing Paint on Non-residential Structures of 26 Mar 92 provides guidance for managing paints containing lead and other hazardous materials in place. The fact that lead was highly used as a primer is indicative of its value to the corrosion control industry. Premature removal of sound lead primer is not considered to be a good management practice.

Activities should consider an annual CCS to survey all structures to be authorized for design in the coming year. When accomplished for multiple projects, the per-structure cost will decrease. By accomplishing this survey prior to design, the basis for design is fully identified.

The CCS can also be a very useful tool when used to screen structures for maintenance painting requirements. A CCS can be scoped to provide a general inspection of many structures to screen for near-term overcoating or recoating requirements, and subsequent investigation can be made to provide appropriate details for project planning and design.

It should be pointed out that the aesthetic features of a coating do not define the coating condition; they only describe how the coating looks. Many coating systems have been replaced when only the topcoat is in need of "refurbishment." Likewise, many structures such as water tanks and fuel tanks have had complete coating replacement when only the roof coating needed replacement. A CCS can identify

the weak components as well as the satisfactory components, and propose solutions to make maximum use of existing resources.

SSPC: The Society for Protective Coatings (SSPC), has published a Technology Update titled SSPC TU 3 Maintenance Overcoating. This document should be used as a guide for scoping the CCS, for accomplishing the CCS, and for designing the coating work.

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NOTE: Designers are encouraged to contact the NAVFAC Paints & Coatings SME, NAVFAC EXWC Code CI 9, 805 982-1057, prior to beginning a new Navy design.

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NOTE: Designers are encouraged to contact the Air Force Civil Engineering Corrosion Program Manager at AFCEC/COSM, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403, Tel 850-283-6070, prior to beginning 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 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.

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2014) Standard Specification for Carbon

	Structural Steel
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1210	(2005; R 2014) Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
ASTM D1475	(2013) Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1640	(2003; R 2009) Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
ASTM D1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D2196	(2010) Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer
ASTM D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D2244	(2015a) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2369	(2010; R 2015; E 2015) Volatile Content of Coatings
ASTM D2370	(1998; R 2010) Tensile Properties of Organic Coatings
ASTM D2698	(2005) Standard Test Method for Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging
ASTM D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D2805	(2011) Standard Test Method for Hiding Power of Paints by Reflectometry
ASTM D3276	(2007) Painting Inspectors (Metal Substrates)
ASTM D3278	(1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D3335	(1985a; R 2014) 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 D3960	(2005; R 2013) Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D4060	(2014) Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D4285	(1983; R 2012) Indicating Oil or Water in Compressed Air
ASTM D4400	(1999; E 2012; R 2012) Sag Resistance of Paints Using a Multinotch Applicator
ASTM D4417	(2014) Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	(2009; E 2010) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D476	(2015) Dry Pigmentary Titanium Dioxide Pigments
ASTM D4940	(2015) Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blast Cleaning Abrasives
ASTM D512	(2012) Chloride Ion in Water
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D56	(2005; R 2010) Flash Point by Tag Closed Cup Tester
ASTM D562	(2010; R 2014) Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
ASTM D5894	(2010) Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM D6944	(2015) Standard Practice for Determining the Resistance of Cured Coatings to Thermal Cycling
ASTM D7091	(2013) Standard Practice for

	Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nondestructive Coatings Applied to Non-Ferrous Metals
ASTM D714	(2002; R 2009) Evaluating Degree of Blistering of Paints
ASTM D7588	(2011) Standard Guide for FT-IR Fingerprinting of a Non-Aqueous Liquid Paint as Supplied in the Manufacturer's Container
ASTM D93	(2015) Flash-Point by Pensky-Martens Closed Cup Tester
ASTM E11	(2015) Wire Cloth and Sieves for Testing Purposes

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 9001	(2008; Corr 1 2009) Quality Management Systems- Requirements

NACE INTERNATIONAL (NACE)

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

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC AB 1	(2013) Mineral and Slag Abrasives
SSPC AB 2	(1996; E 2004) Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC AB 3	(2003; E 2004) Ferrous Metallic Abrasive
SSPC Guide 12	(1998; E 2004) Guide for Illumination of Industrial Painting Projects
SSPC Guide 6	(2004) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC PA 17	(2012; E 2012) Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
SSPC PA 2	(2015) Procedure for Determining Conformance to Dry Coating Thickness Requirements

SSPC QP 1	(2012; E 2012) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
SSPC QP 5	(2012) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC QS 1	(2004) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC SP 5/NACE No. 1	(2007) White Metal Blast Cleaning
SSPC SP COM	(2004) 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

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-161	(2005; Rev G; Notice 1 2010) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1689	(Rev B) Tape, Pressure-Sensitive Adhesive, (Plastic Film)
FED-STD-595	(Rev C; Notice 1) Colors Used in Government Procurement

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

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

1.2 DEFINITIONS

Definitions are provided throughout this Section, generally in the paragraph where used, and denoted by capital letters.

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 to reflect only the submittals required for the project.

The Guide Specification technical editors have designated 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 submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

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" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-05, Design Data

Containment System

SD-06 Test Reports

Joint Sealant Qualification Test Reports

Coatings Qualification Test Reports

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

Metallic Abrasive Qualification Test Reports

Coating Sample Test Reports

Abrasive Sample Test Reports

Inspection Report Forms

Daily Inspection Reports

Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

SD-07 Certificates

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Implement Corrective Action

Coating Work Plan

Coating Materials

Coating System Component Compatibility

Non-metallic Abrasive

Metallic Abrasive

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications Of Individuals Performing Abrasive Blasting

Qualifications of Individuals Applying Coatings

Qualifications of Individuals Operating Plural Component Equipment

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coating Inspection Company

Qualifications of QC Specialist Coating Inspector

Qualifications of Testing Laboratory for Coatings

Qualifications of Testing Laboratory for Abrasive Media

Qualifications of Certified Coating Contractors

Joint Sealant Materials

SD-08 Manufacturer's Instructions

Joint Sealant Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive

Inspection Logbook; 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 Coating 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) should 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 Quality Control Plan.

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. Develop Corrective Action Request (CAR) forms for initiating CA, and for tracking and documenting each step.

1.4.2.2 Implement Corrective Action

The Contractor must take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These procedures must apply to non-compliance in the work, and to non-compliance in the QC System. Corrective actions must be appropriate to the effects of the non-compliance encountered. Each CAR must be serialized, tracked in a Log to completion and acceptance by the Contracting Officer, and retained in project records. The Corrective Action Log, showing status of each CAR, must be submitted to the Contracting Officer monthly. A CAR may be initiated by either the Contractor or the Contracting Officer. The Contracting Officer 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.

1.4.3 Coating 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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a. This work plan must be considered as part of the Quality Control Plan.

b. Provide procedures for reviewing contract documents immediately after award to identify errors, omissions, and discrepancies so that any such issues can be resolved prior to project planning and development of detailed procedures.

c. Provide procedures for verification of key processes during Initial Phase to ensure that contract requirements can be met. Key processes must include surface preparation, coating application and curing, inspection, and documentation, and any other process that might adversely impact orderly progression of work.

d. Provide procedures for all phases of coating operations, including planned work, rework, repair, inspection, and documentation. Address mobilization and setup, surface preparation, coating application, coating initial cure, tracking and correction of non-compliant work, and demobilization. Coordinate work processes with health and safety plans and confined space entry plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

[e. Provide procedures for determining the existing surface profile under paint, and procedures for ensuring that the profile is not increased beyond the maximum profile specified herein.

] f. Provide procedures for correcting non-compliant work. Detailed procedures are required in advance to avoid delays in meeting overcoat windows as well as to avoid delays in production. Provide procedures for repairing defects in the coating film, such as runs, drips, sags, holidays, overspray, as well as how to correct coating thickness non-compliance, any other areas of repair or rework that might be adversely affected by delays in preparing and approving new procedures.

g. If a procedure is based on a proposed or approved request for deviation, the deviation must be referenced. Changes to procedures must be noted by submittal number and date approved, clearly delineating old requirements and new requirements, so that the records provide a continuous log of requirements and procedures.

1.4.4 Design Data

1.4.4.1 Containment System

Submit complete design drawings and calculations for the scaffolding and containment system, including an analysis of the loads which will be added to the structure by the containment system and waste materials. A registered engineer must approve calculations and scaffold system design.

1.4.5 Test Reports

1.4.5.1 Joint Sealant Qualification Test Reports

Submit test results from independent laboratory of representative samples of joint sealant material. Samples must have been tested within the last five years. Submit results as required in paragraph QUALITY ASSURANCE PROVISIONS of ASTM C920. Note that testing in accordance with QUALITY ASSURANCE PROVISIONS is a pre-qualification requirement.

1.4.5.2 Coatings Qualification Test Reports

Submit test results from independent laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be independent laboratories for purposes of compliance with "QUALIFICATION INSPECTION" requirements herein. Samples must have been tested within the last three years. Submit results for Non-Zinc Epoxy Barrier Coating, Flexible and Fluoropolyurethane material as required in their respective Table II and IIA, COATING QUALIFICATION INSPECTION REQUIREMENTS/COATING QUALIFICATION INSPECTION REQUIREMENTS TEST PANEL PREPARATION AND TEST and as revised by paragraph COATING SYSTEM herein. Note that requirements for QUALIFICATION INSPECTION is a pre-qualification requirement, and involves the same testing required for listing as an approved source for these respective materials.

1.4.5.3 Metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of SSPC AB 3. Submit test results from independent 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 prequalifying the abrasive.

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

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

1.4.5.5 Non-metallic Abrasive Qualification Test Reports

Submit results for abrasive as required in paragraph 4 REQUIREMENTS of SSPC AB 1. Submit test results from independent 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 prequalifying the 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 hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. 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 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 coating inspection company to which the coating 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 must be notified of any change in certification status within 10 days of the change. The PCS must not be the designated coating inspector.

1.4.6.3 Qualifications of Coating Inspection Company

Submit documentation that the coating inspection company that will be performing all coating inspection functions is certified by SSPC to the requirements of SSPC QP 5 prior to contract award, and must remain certified while accomplishing any coating inspection functions. The coating inspection company must remain so certified for the duration of the project. If a coating 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 any change in coating inspection company certification status. The coating inspection company submitted and approved must remain through the completion of the contract.

1.4.6.4 Qualifications of QC Specialist Coating Inspector

Submit documentation that each coating inspector is employed, and qualified to SSPC QP 5, Level II, by the selected coating inspection company. Each inspector must remain employed by the coating inspection company while performing any coating inspection functions.

1.4.6.5 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 SSPC to the SSPC C 7 Abrasive Blaster or the SSPC CAS Coating Application Specialist Level 2 Certification Program (Interim Status). Each blaster must remain certified during the entire period of abrasive blasting, and the Contracting Officer must be notified of any change in qualification status.

1.4.6.6 Qualifications of Individuals Applying Coatings

Submit name, address, telephone number, of each person that will be operating plural component equipment. Submit documentation that each operator is qualified by SSPC to the SSPC C 12 Spray Application Certification meeting the NAVSEA 009-32 requirements or the SSPC CAS Coating Application Specialist Level 2 Certification Program (Interim Status). Each operator must remain certified during the entire period of coating application and the Contracting Officer must be notified of any change in qualification status.

1.4.6.7 Qualifications of Individuals Operating Plural Component Equipment

Submit name, address, telephone number, of each person that will be operating plural component equipment. Submit documentation that each operator is qualified by SSPC to the SSPC C 14 Marine Plural Component Program(MPCAC-C14). Each operator must remain certified during the entire period of coating application and the Contracting Officer must be notified of any change in qualification status.

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 selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.9 Qualifications of Testing Laboratory for Abrasive Media

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of abrasive for compliance with specification requirements. Submit documentation that laboratory has experience in testing samples of abrasive for conformance with specifications, and that persons performing analyses are qualified.

1.4.6.10 Qualifications of Certified Coating 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 13.00 20 LEAD IN CONSTRUCTION or 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD.
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NOTE: Solicitations requiring certification for prequalification should 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. This is analogous to requiring bidders to have a specified level of experience or expertise and GAO has sustained these types of special requirements.
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All Contractors and Subcontractors that perform surface preparation or coating application must be certified to SSPC QP 1 and SSPC QS 1 prior to contract award, and must remain certified while accomplishing any surface preparation or coating application. The painting Contractors and painting Subcontractors 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 audits from SSPC and furnish a copy of all audit reports.

[For OCONUS, non-US territories where documentation is provided that SSPC QP 1 and SSPC QS 1 certified contractors did not bid and are not available, all Contractors and Subcontractors that perform surface preparation or coating application must be certified to ISO 9001 prior to contract award, and must remain certified while accomplishing any surface preparation or coating application. The painting Contractors and painting Subcontractors 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.

]1.4.6.11 Joint Sealant Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.12 Coating Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.13 Coating System Component Compatibility

Provide certification from the manufacturer of the Joint Sealant material, coating system primer, Non-Zinc Epoxy Barrier Coating, Flexible and topcoat, Fluoropolyurethane that the supplied coating materials are suitable for use in the specified coating system. Each manufacturer must identify the specific products, including manufacturer's name, which their product may be used with. The certification must provide the name of the manufacturer that will provide technical support for the entire system. When all coating materials are manufactured by one manufacturer, this certification is not required.

1.4.6.14 Non-Metallic Abrasive

Provide manufacturer's certification that the materials are currently approved by the Naval Sea Systems Command and listed on the Qualified Products Lists (QPL) for the specified materials.

1.4.6.15 Metallic Abrasive

Provide manufacturer's certification of conformance to contract requirements and provide copies of test results.

1.4.7 Protective Coating Specialist (PCS)

The PCS must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. The PCS must approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

1.4.8 Pre-Application Meeting

After approval of submittals but prior to the initiation of coating work, Contractor representatives, including at a minimum, project superintendent and QC manager, paint foreman, coating 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, coating 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, number and types of coats required, minimum and maximum application temperatures, and curing procedures. Include materials safety data sheets (MSDS) 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 materials safety data sheets (MSDS) 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 29 degrees C 40 and 85 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 may 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 may issue an extension, referencing the product evaluation and the review of storage records. Products may not be extended longer than allowed in the product specification.

1.7 COATING HAZARDS

****
NOTE: This specification Section should 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 all 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 JOB SITE REFERENCES

****
NOTE: Include any other jobsite related references that might be added during design.
****

Make available to the Contracting Officer at least one copy each of ASTM D3276, ASTM D3925, ASTM D4285, SSPC SP COM, SSPC SP 1, SSPC 7/NACE No.4, SSPC SP 10/NACE No. 2, SSPC PA 1, SSPC PA 2, SSPC Guide 6, SSPC VIS 1, SSPC QP 1, SSPC QS 1, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 JOINT SEALANT

ASTM C920, Type M, Grade NS, Class 25, Use NT, M, G, A, O

2.2 COATING SYSTEM

****
NOTE: Include bracketed text for new construction only.
****

Alternate systems or products will not be considered. All prime and topcoat materials must be 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. Remove all shop-applied primer prior to final field surface preparation and coating system application. Adjust all shop preparation to avoid conflicts with final surface preparation requirements.]

The coating specifications for the Non-Zinc Epoxy Barrier Coating, Flexible prime and Fluoropolyurethane topcoat products in this Section require testing of the products by an Independent Laboratory to the QUALIFICATION INSPECTION requirements of Table II and IIA prior to contract award or must be listed as an approved material herein. See specific submittal requirements in paragraph QUALITY ASSURANCE.

2.2.1 Non-Zinc Epoxy Barrier Coating, Flexible

Prime Coat (<50 g/l VOC) Tint to a contrasting color to the topcoat using dispersions prepared for epoxy paint tinting. Manufacturer must tint material and appropriately label. Tint to approximately no lighter than FED-STD-595 color No. 27885 or no darker than color No. 27778.

2.2.1.1 Premier Coating Systems, PCS-No. 1111 Epoxy Barrier Coating

2.2.2 Fluoropolyurethane, Topcoat

****

NOTE: Check with the activity to determine the desired topcoat color and finish. Generally, use white for Navy projects and beige for Air Force projects. Color number 17925 is white, and 27769 is beige. FAA Safety colors are White 17875 and Orange 12197. Always specify contrasting colors between coats.

****

Fluoropolyurethane, Topcoat must be capable of being produced in the following colors. [White FED-STD-595 color number 17925][Beige FED-STD-595 color number 27769 in gloss][White FED-STD-595 color number 17875, and Orange FED-STD-595 color number 12197].

2.2.2.1 Premier Coating Systems, Inc. PCS-No. 4300 FPU (Fluoropolyurethane) Pigmented, Exempt

[2.3 COLOR IDENTIFICATION OF FUEL HANDLING AND STORAGE FACILITIES

Piping, conduit, and tank identification must be in accordance with MIL-STD-161. Mark direction of fluids in accordance with MIL-STD-161. The NATO symbol for JP-8 is F-34.

]2.4 COATING SAMPLE COLLECTION AND SHIPPING KIT

Provide 2 kits that contains one liter quart can for the base and activator of each SZC material, an appropriately sized can for each activator, dipping cups for each component to be sampled, a shipping box sized for the samples to to be shipped, and packing material. Extract 2 samples of each component, mark cans for the appropriate components including manufacturers name, address, batch numbers, batch size shipped to the project sight and date of manufacture. Store in QC Manager's office until completion of project. If unforeseen coating issues arise ship 1 complete sample (including base and activator) with all batch information to the pre-chosen approved Independent laboratory for evaluation. Include all pertinent information from the project. The QC Manager is to arrange pick-up and shipping to the approved coating testing laboratory.

2.5 ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one suitable plastic bag or container for each sample to be collected. Mark containers for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved testing laboratory.

2.6 TEST KITS

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

Provide test kits called CHLOR*TEST CSN Salts, as manufactured by CHLOR*RID International Inc. of Chandler, Arizona (www.chlor-rid.com) or equal. An "equal" test kit must meet the following requirements:

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

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

c. Kit components and solutions are mercury free and environmentally friendly;

d. Kit contains new materials and solutions for each test extraction;

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

f. 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.

2.6.2 Test Kit for Measuring Chlorides in Abrasives

Provide test kits called CHLOR*TEST-A, as manufactured by CHLOR*RID International Inc. of Chandler, Arizona (www.chlor-rid.com), or equal. To be considered for approval as an "equal" test kit, each proposed test kit must:

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

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

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

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

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

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

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

2.6.3 Test Kit for Identifying Amine Blush on Epoxy Surfaces

After the primer coat has hardened and prior to applying the next coat, test for unreacted amines using the AMINE BLUSH CHECK, manufactured by

Elcometer, Rochester Hills, Michigan, or equal. To be considered for approval as an "equal" test kit it must meet the following requirements:

a. Be 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. Use an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;

c. Kit contains no mercury or lead and is environmentally friendly;

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

2.7 ABRASIVE

The referenced abrasive specifications have maximum limits for soluble salts contamination, 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. 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 chlorides 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.
****

[Interpret SSPC AB 1 to include the meaning that abrasive material contains a maximum one percent by weight of any toxic substance listed in either Table Z-1, Z-2, or Z-3 or 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.
****

2.7.1 Non-metallic Abrasive

Conform to SSPC AB 1, Class A except that:

[a. The gross gamma radioactivity must not exceed 5 picocuries per gram.

] b. The maximum allowable chloride content is 7 parts per million (ppm) as measured with the test kit described in the 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 required.

c. The maximum allowable Chromium and Cadmium content of the work mix must

be less than 0.1 percent by wt. 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.

Use abrasive that is specifically selected and graded to provide a sharp, angular profile to the specified depth. Do not use ungraded abrasive. Make adjustments to processes or abrasive gradation to achieve specified surface profile. Recycled non-metallic abrasive must meet all requirements of the specification each time that it is placed in the blast pot.

2.7.2 Metallic Abrasive

2.7.2.1 New and Remanufactured Steel Grit

Conform to the chemical and physical properties of SSPC AB 3 Class 1 (Steel) only[, except that the gross gamma radioactivity must not exceed 5 picocuries per gram]. Class 2 (Iron) abrasive must not be used.

To develop a suitable work mix from new steel abrasive, a minimum of 200 - 400 recycles is required, therefore, it is advantageous for a Contractor to use remanufactured steel grit or grit reclaimed from a previous project. Such grit must be considered to conform if it can 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 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.

2.7.2.2 Recycled Metallic Abrasive Media

Abrasive media must conform to the chemical and physical properties of SSPC AB 2 except that:

a. The maximum allowable chloride content is 7 parts per million (ppm) as measured with the test kit described in the 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 required.

b. The maximum allowable Chromium and Cadmium content of the work mix must be less than 0.1 percent by wt. 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.

2.8 White Aluminum Oxide Non-skid Grit

Size No. 60, dust free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested in accordance with ASTM E11 using a 1000 gram 2.2 poundsample:

Sieve No.	Percent Retained
40	0

Sieve No.	Percent Retained
50	15-40
60	60-85

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coating Work Plan.

[3.1 REMOVAL OF COATINGS CONTAINING HAZARDOUS MATERIALS

****

NOTE: Include Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD in any project specification that requires removal or disturbance of coating containing hazardous materials. Include a contractor qualification requirement similar to the paragraph QUALIFICATIONS OF COATING CONTRACTORS in Part 1 of this Section, except that the contractor must be qualified to SSPC QP-2, Category A. The removal of coatings containing hazardous materials and application of new coating system 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 project. With the use of SSPC QP-1 and QP-2 requirements in contracts, the same contractor will generally be accomplishing both phases of work, and will probably want to perform both phases as a single operation so as not to have to prepare surface twice. To accomplish the coating removal and recoating in a continuous operation, the contractors 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 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD. Coordinate surface preparation requirements from Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD with this Section.

]3.2 COATING AND ABRASIVE SAMPLE COLLECTION AND TESTING

Sample and test materials delivered to the jobsite. Notify Contracting Officer three days in advance of sampling. The QC Manager and either the PCS or coating inspector must witness all sampling.

3.2.1 Coating Sample Collection

Provide 2 sample collection kits as required in paragraph COATING SAMPLE

COLLECTION AND SHIPPING KIT. From each lot, obtain 2 one liter quart sample of each base material, and proportional samples of each activator based on mix ratio, by random selection from sealed containers in accordance with ASTM D3925. 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 held if the need to ship to laboratory arises, 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. The QC manager will take possession of the packaged samples and hold until instructed to contact a shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by paragraph COATING SAMPLE TEST REPORTS.

3.2.2 Abrasive Sample Collection

Provide a sample collection kit as required in paragraph ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT. 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. Obtain samples of each abrasive lot using the sampling techniques and schedule of the relevant SSPC AB standard reference. 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 as required by the paragraph ABRASIVE SAMPLE TEST REPORTS.

3.2.3 Coating Sample Test Reports

Submit test results for each lot of coating material delivered to the jobsite. Test samples of prime and topcoat materials for compliance with requirements of Table I and 1A. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2.4 Abrasive Sample Test Reports

Submit test results for each lot of abrasive delivered to the jobsite. Test samples of metallic abrasive to the requirements of paragraph REQUIREMENTS of SSPC AB 3, except paragraph 4.1.5 DURABILITY. Test samples of non-metallic abrasive to the requirements of paragraph REQUIREMENTS of SSPC AB 1. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.3 SURFACES TO BE COATED

Coat exterior surfaces of [tank][structure][_____][including steel roof, shell, legs, stair, railing, and other exterior appurtenances].

3.4 LIGHTING

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

3.5 ENVIRONMENTAL CONDITIONS

3.5.1 Containment

****

NOTE: Containment was a design option in previous versions where site congestion dictated control of dust and paint overspray. Experience has shown, however, that containment also provides cost-effective control of environmental conditions, and the better conditions result in a better coating product.

SSPC Guide 6, has four classes of containment, from Class 1 being the highest level of control. Generally Classes 1 and 2 are only required for removal of hazardous materials, while Class 3 is probably satisfactory for most coating operations. Class 4 requires minimal "knockdown" of airborne debris, and is not generally usable as an airborne particulate control measure.

****

Design and provide a containment system for the capture, containment, collection, storage and disposal of the waste materials generated by the work under this Section, to meet the requirements of SSPC Guide 6, Class [1][2][3]. Vapor concentrations must be kept at or below 10 percent of Lower Explosive Limit (LEL) at all times. Containment may be designed as fixed containment for complete structure or portable containment for sections of structure, however, containment must remain in any one place from beginning of abrasive blasting through initial cure of coating. Waste materials covered by this paragraph must not include any material or residue from removal of coatings containing lead, chromium, cadmium, PCB, or any other hazardous material. These must be handled in accordance with Section 02 82 33.13 20 REMOVAL/CONTROL AND DISPOSAL OF PAINT WITH LEAD.

It is the Contractors responsibility to insure the feasibility and workability of the containment system. The Contractor must perform his operations and work schedule in a manner as to minimize leakage of the containment system. The containment system must be properly maintained and must not deviate from the approved drawings. If the containment system fails to function satisfactorily, the Contractor must suspend all operations, except those required to minimize adverse impact on the environment or government property. Operations must not resume until modifications have been made to correct the cause of the failure.

3.5.2 Automated Monitoring Requirements

Provide continuous monitoring of temperature, relative humidity, and dew point data at pertinent points on the structure, during surface preparation, coating application, and initial cure. Locate sensors to provide pertinent data for the surface preparation and coat application being performed. Monitor any heating, cooling, or dehumidification equipment used. Make data available to the Contracting Officer through Internet access. Provide monitoring equipment to perform as follows:

a. Data is collected in the field unit in one minute increments, and available for download (on-site) in a standard format. Contractor must

collect this data and make available to the Contracting Officer;

b. Monitoring equipment must have backup power such that data collection and transmission to web server 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 150 foot diameter by 50 foot high tank;

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

e. Data must be available continuously through secure Internet connection, using widely available web browsers;

f. Internet accessible data must be collected and stored in maximum 15 minute increments, and lag time between data collection and online availability must be no greater than 70 minutes;

g. Internet accessible data must be available for viewing online in tabular format, and graphical format using selected data;

h. Internet accessible data must be available for download in user-defined segments, or entire project to date, in a standard format usable by Microsoft Excel and other spreadsheet programs;

i. Internet-based controls must provide alerts to pre-designated parties through e-mail messaging;

j. Internet-based controls must monitor data uploads from field unit and issue alert if data not initiated within 60 minutes of last upload;

k. Internet-based controls must monitor operation of DH equipment and issues alert when power remains off for more than 15 seconds, or if pre-determined temperature, RH, or DP conditions are exceeded;

The requirements listed here were developed around the Munters Exactaire Monitoring System, as this was the only monitoring system having Internet connectivity known to be commercially available. There is no requirement for connectivity of the monitoring system to control the DH equipment, therefore, any combination of equipment having the required functionality will be accepted.

3.6 SURFACE PREPARATION

****

NOTE: When editing this specification for maintenance coating work where Water jet cleaning 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. Refer to SSPC-SP WJ-1/NACE WJ-1 Waterjet Cleaning of Metals - Clean to Bare Substrate, SSPC-SP WJ-2/NACE WJ-2 Waterjet Cleaning of Metals - Very Thorough Cleaning, SSPC-SP WJ-3/NACE WJ-3 Waterjet Cleaning of Metals - Thorough Cleaning, and SSPC-SP WJ-4/NACE

WJ-4 Waterjet Cleaning of Metals - Light Cleaning. 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 may not be suitable for water jetting.

****

3.6.1 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.

3.6.2 Operational Evaluation of Abrasive

Test abrasive for salt contamination and oil contamination as required by the appropriate abrasive specification daily at startup and every five operating hours thereafter.

3.6.3 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 SSPC PA 17 using Rmax as the measure of profile height. 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.

3.6.4 Pre-Preparation Testing for Surface Contamination

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

3.6.4.1 Pre-Preparation Testing for Oil and Grease Contamination

****

NOTE: When specifying maintenance painting, use a water based pH neutral degreaser to avoid damaging existing coating.

****

a. Inspect all surfaces for oil and 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 or grease contamination.

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 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 orgrease 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 may not be used during inspection of prepared surfaces for oil and grease contamination unless proven to fluoresce the oil and grease found 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 surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

3.6.4.2 Pre-Preparation Testing for Soluble Salts Contamination

Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. Soluble salt 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. This phase is recommended since pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. 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 washing and soluble salts remover. The soluble salts remover must be acidic, biodegradable, nontoxic, noncorrosive, 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 selected at the Contractor's discretion.

3.6.5 Abrasive Blasting

****

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 2-3 mil surface profile is the preferred depth for preparing new surfaces for the prime coat. On steel that was previously prepared to a deeper depth and coated, it is not feasible to

reduce the deeper depth to the preferred depth. A depth of 4 mils or more can be tolerated with this coating but additional application of the prime coat thickness will be required to meet the specification required DFT.

Designers must be aware that profile found to be in excess of 3 mils may require additional funding to add extra coating material.

To validate contractor claims of pre-existing profile greater than allowed, test an appropriate number of representative spots with abrasive that removes paint but does not affect profile, such as bicarbonate of soda, or other soft abrasive, or waterblasting.

****

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

b. On new surfaces abrasive blast steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2. Prepared surfaces must conform to SSPC VIS 1 and must match the prepared test-panels. Provide a 50 to 75 micron 2 to 3 mil surface profile. Reject profile greater than 75 microns 3 mils, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with SSPC PA 17, using Rmax as the measure of profile height. 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 reblasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Do not attempt to wipe surface clean.

c. On previously coated and prepared surfaces determine and establish the average blast profile existing. If existing blast profile is greater than the required 75 microns 3 mils established for new surfaces this average profile must be reported and a mutual agreement by the government and contractor at the pre-application meeting must be detemined to not increase the existing profile. Abrasive blast the steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2 using abrasive and technique which does notincrease the existing profile. Provide a minimum 75 microns 3 mils surface profile 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. Measure surface profile in accordance with SSPC PA 17, using Rmax as the measure of profile height. 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 reblasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Do not attempt to wipe surface clean.

3.6.6 Disposal of Used Abrasive

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

3.6.7 Pre-Application Testing For Surface Contamination

3.6.7.1 Pre-Application Testing for Oil and Grease Contamination

Ensure surfaces are free of contamination as described in paragraph PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION, except that only questionable areas need be checked for beading of water misted onto surface.

3.6.7.2 Pre-Application Testing for Soluble Salts Contamination

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NOTE: On new structures, require 30 percent of tests to be accomplished at welds. On structures that have been in service, corroded areas should also be tested for high chlorides.

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Test surfaces for chloride contamination using the Test Kit described in 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 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 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as discussed in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show allowable results. Reblast tested and cleaned areas as required. Label all test tubes and retain for test verification.

3.6.7.3 Pre-Application Testing for Surface Cleanliness

Apply coatings to dust free surfaces. To test surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminant. Reject contaminated surfaces 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. Attach test tapes to Daily Inspection Reports.

3.7 MIXING AND APPLICATION OF SEALANT AND COATING SYSTEM

3.7.1 Preparation of Sealant and Coating Materials for Application

Each of the sealant, prime, and topcoat materials is a two-component material supplied in separate containers. Do not mix partial kits or alter mix ratios.

3.7.1.1 Mixing Sealant and Prime Materials

Mix in accordance with manufacturer's instructions, which may differ for each product. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Do not add solvent without specific written recommendation from the manufacturer. Allow mixed material to stand for the required induction time based on its temperature.

3.7.1.2 Mixing Topcoat Material

Mix Fluoropolyurethane coating materials in same temperature conditions specified in paragraph DELIVERY AND STORAGE. The Fluoropolyurethane coating material is moisture sensitive and any introduction of moisture or water into the material during mixing or application will shorten usable pot life. Use a mixer that does not create a vortex. Do not add solvent without specific written recommendation from the manufacturer. No induction time is required, only thorough agitation of the mixed material.

3.7.1.3 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. Solvent should not be required or added to these products. Do not add solvent to extend pot life. 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. Precooling or exterior icing of components for at least 24 hours to a minimum of 10 degrees C 50 degrees F in hot climates will extend pot life. High humidity at time of mixing and application may shorten pot life of the Fluoropolyurethane topcoat material. Following are approximate pot life times:

Sealant	As specified by manufacturer
Non-Zinc Epoxy Barrier Coating, Flexible, prime	3/4 to 1 1/2 hours
Fluoropolyurethane topcoat	2 hours

3.7.1.4 Application Conditions and Recoat Windows

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NOTE: These new 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 should 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 should not be used to simply save money, as the coating system will generally not have the same longevity as one applied within 16-48 degrees C 60-120 degrees F.

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a. The application condition requirements for the coating system are time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of sealant and coating materials, 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 between 16 and 38 degrees C 60 and 100 degrees F during application and the first four hours of cure for epoxy coats and the first eight hours of cure for polyurethane coats. Maintain steel surface temperature more than 3 degrees C 5 degrees F above the dew-point of the ambient air for the same period.

c. Use Table entitled RECOAT WINDOWS to determine appropriate recoat windows for each coat after the initial coat. Apply each coat during appropriate RECOAT WINDOW of preceding coat. If a RECOAT WINDOW is missed, the minimum and maximum finish coat thickness may be adjusted to accommodate the total film thickness requirement, however, requirements for total coating thickness will not be modified. Missing more than one RECOAT WINDOWS may require complete removal of coating if maximum total coating thickness requirements cannot be achieved.

d. If coating is not applied during RECOAT WINDOW, or if surface temperature exceeds 49 degrees C 120 degrees F between applications, provide GLOSS REMOVAL, apply next coat within 24 hours. If next planned coat is topcoat, apply FILL COAT if required to fill sanding marks. Sanding marks from GLOSS REMOVAL of prime coat reflecting through topcoat will be considered as noncompliant. Apply FILL COAT within 24 hours of GLOSS REMOVAL, then apply topcoat within RECOAT WINDOW of FILL COAT.

RECOAT WINDOWS						
EPOXY OVER EPOXY						
Temperature degrees C Temperature degrees F	16-21 60-70	22-27 71-80	28-32 81-90	33-38 91-100	39-43 101-110	44-49 111-120

RECOAT WINDOWS						
RECOAT WINDOW (Hrs.)	36-240	36-168	24-120	24-96	16-48	16-48
FLUOROPOLYURETHANE OVER EPOXY						
Temperature degrees C Temperature degrees F	16-21 60-70	22-27 71-80	28-32 81-90	33-38 91-100	39-43 101-110	44-49 111-120
RECOAT WINDOW (Hrs.)	36-240	36-168	24-120	24-96	16-48	16-48
FLUOROPOLYURETHANE OVER FLUOROPOLYURETHANE						
Temperature degrees C Temperature degrees F	16-21 60-70	22-27 71-80	28-32 81-90	33-38 91-100	39-43 101-110	44-49 111-120
RECOAT WINDOW (Hrs.)	8-48	6-48	4-36	3-24	2-12	1-2

The temperature ranges shown in the table above are for determining recoat windows. Choose recoat window based on the highest surface temperature that was sustained for one or more hours between coats. This applies to the entire time between coats. Measure and record air and surface temperatures on hourly basis to determine appropriate recoat windows. If surface temperature goes above 38 degrees C 100 degrees F, measure and record temperatures every half hour.

FILL COAT - Where indicated, apply coat of prime coat epoxy, at 50 to 100 microns 2 to 4 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 GLOSS REMOVAL procedure.

GLOSS REMOVAL - Where required, hand sand in a linear 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 prime coat is to scarify surface and must consist of removal of approximately 50 to 100 microns 2 to 4 mils of coating. If steel is exposed during GLOSS REMOVAL, repair in accordance with paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. GLOSS REMOVAL of prime coat may include removal of up to 150 microns 6 mils of coating to avoid excess thickness, prior to application of FILL COAT.

3.7.2 Amine Blush Testing of Epoxy Coat Prior to Overcoating

Test sealant surfaces prior to application of prime coat, and prime coat surfaces prior to application of Fluoropolyurethane topcoat 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 an approved amine removal procedure or increase testing to ensure that all contamination is located and remove any identified contamination using an approved procedure.

3.7.3 Application of Coating System and Joint Sealant

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

b. After surface preparation and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION, as necessary, to ensure minimal intercoat contamination. 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. Concern for intercoat contamination should be continually prevalent, and spot testing should be accomplished to verify satisfactory conditions. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

c. Apply each coat in a consistent wet film, at 90 degrees to previous coat. Ensure that prime coat "cold joints" are no less than 150 mm six inches from welds. Apply stripe coat by brush. 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 [three][_____] meters [15][_____] feet from the [structure perimeter][tank berm][_____]. Cover or protect all surfaces that will not be coated. The cleanliness, temperature, recoat windows, and airborne paint containment requirements may necessitate the use of enclosures, portable shelters, or other appropriate controls.

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NOTE: Maximum thickness measurements are to limit internal stresses in each coat and in the total system. Internal stresses of epoxy and polyurethane 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. The Non-Zinc Epoxy Barrier Coating, Flexible used in

this section does not develop typical high stresses of epoxy coatings, therefore, maximum thicknesses of the prime may be exceeded by up to 50 percent without adversely affecting the coating integrity. If a contractor experiences excessive thickness, this should be addressed by Corrective Action, as excessive thickness costs the contractor more and will ultimately cost more to remove when required during a later project. This system is limited to 13 mils to allow for maintenance overcoating without creating excessive film build.

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Apply coatings at the following specified thickness:

Coat	Minimum DFT (Microns)	Maximum DFT (Microns)
Stripe Coat, (not calculated in Total System)	75	200
Prime, Non-Zinc Epoxy Barrier Coating, Flexible	200	250
Topcoat, Fluoropolyurethane	50	75
Total System	250	325

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Stripe Coat, (not calculated in Total System	3	8
Prime, Non-Zinc Epoxy Barrier Coating, Flexible	8	10
Topcoat, Fluoropolyurethane	2	3
Total System	10	13

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.

3.7.3.1 Application of Stripe Coat

Apply a stripe coat of Non-Zinc Epoxy Barrier Coating, Flexible material by brush, working material into corners, crevices, pitted areas, angles and welds and onto outside corners and angles. For convenience, with approved procedures which include appropriate controls for thickness, stripe coat material may be delivered by spray if followed immediately with brush-out. Allow sufficient dry time for application of Prime Coat within RECOAT WINDOW of Stripe Coat.

3.7.3.2 Application of Prime Coat

Apply prime coat of Non-Zinc Epoxy Barrier Coating, Flexible material by spray within RECOAT WINDOW of stripe coat, allowing sufficient dry time for application of prime coat within RECOAT WINDOW of stripe coat.

3.7.3.3 Non-skid for Stairs and Top

Where non-skid is required, apply a second prime coat, and immediately follow with application of non-skid grit, broadcast at the rate of 2 pounds per 100 square feet, and backroll. Apply topcoat as specified.

3.7.3.4 Application of Topcoat

Make all required repairs to prime coat as specified in the paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING prior to applying topcoat. Apply topcoat within RECOAT WINDOW of prime coat. The Fluoropolyurethane topcoat may require multiple passes to achieve desired aesthetics and required thickness. Consult manufacturer for thinning and application procedures for anticipated temperature, humidity, and wind conditions. Touch-up blemishes and defects within recoat window of Fluoropolyurethane topcoat. Retain sample of Fluoropolyurethane topcoat, from the same batch used to coat structure, to make touch-ups that might be required later.

3.7.3.5 Application of Joint Sealant

Apply joint sealant to back-to-back steel joints that are less than 3/8 inches wide and are not seal welded. Apply sealant to top and bottom, or each side, of narrow joints. Apply sealant within 48 hours of application of the topcoat, and touch-up with topcoat after appropriate cure of the sealant.

3.7.3.6 Holiday Testing

No sooner than 24 hours after application of the first coat, and normally 36 hours, perform holiday testing in accordance with the low voltage wet sponge method of NACE SP0188, with no added surfactants. Repair holidays per paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. Do not allow moisture from sponge to remain on the coated surfaces more than ten minutes. Remove excess moisture with a clean rag.

3.7.3.7 Procedure for Holiday and Spot Repairs of Newly Applied Coating

Repair coating film defects at the earliest practicable time, preferably before application of the succeeding 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. 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 preceeding coat. Within four hours of preparation, apply Non-Zinc Epoxy Barrier Coating, Flexible prime coat to prepared steel and feather onto prepared primer. Apply Fluoropolyurethane topcoat to prime coat and feather to prepared topcoat. Apply each repair coat to approximate thickness of surrounding coating system.

3.7.3.8 Structure Occupancy After Coating Application

Use clean canvas or other approved shoe covers when walking on coated surfaces, regardless of curing time allowed. For heavily trafficked areas, provide cushioned mats for additional protection.

3.8 PROJECT IDENTIFICATION

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

Date exterior coated:
Project Number:
Contractor:
Address:
Coating System
Surface Prep: SSPC SP _____ Profile: _____
Prime: _____ Thickness: _____
Topcoat: _____ Thickness: _____
Total Thickness: _____

3.9 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, must be based on documented evidence of compliance with all requirements and approved Coating Work Plan procedures. Track inspections and tests in the Test Plan & Log.

For marking of surfaces, use chalk for marking bare steel, and water based markers for marking coated surfaces, and remove marks prior to coating. Do not use any wax or grease based markers, or any other markers that leave a residue or stain.

3.9.1 Coating Inspector

The coating inspector must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. The Coating 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 as specified in Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. The Coating 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 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL.

3.9.2 Field Inspection

3.9.2.1 Inspection Requirements

a. Perform field inspection in accordance with ASTM D3276 and the approved Coating Work Plan. Document Contractor's compliance with the approved

Coating 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. NOTE: Data collected on Environmental conditions in paragraph 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 approved Coating Work Plan.

3.9.2.2 Inspection Report Forms

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.

3.9.2.3 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 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. Each report must be signed by the coating inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.9.2.4 Inspection Logbook

A continuous record of all activity related to this Section must employ the electronic reporting program TruQC or equivalent as outlined in Table III 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. The designated Government Representative for the project is assigned the highest level Administrator privilages and only the Administrator must be able to modify reports.

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 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. The Coating Inspector's Logbook that is sold by NACE is satisfactory. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.9.2.5 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.

3.9.2.5.1 Black Light

Use a black light having a 365 nanometer intensity of 4,000 microwatts per square centimeter minimum at 380 mm 15 inches. The Spectroline BIB-150P from Spectronics Corporation satisfies this requirement.

3.10 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. 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						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Non-Zinc Epoxy Barrier Coating, Flexible						
Test	Componenent A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Solids, by weight(ASTM D2196), Method E					97 percent	
Viscosity, Brookfield, mPa-s (cp) (ASTM D2196), Test Method A, 10 rpm, Spindle 3 , Mixed (Comp. A & B) at 25 C 77 F					5500	7000
Weight ASTM D1475						
Kilograms per liter	1.08	1.23	1.38	1.53	1.23	1.38
Pounds per gallon	9.00	10.25	11.50	12.75	10.25	11.50
Dry Time (ASTM D1640), at 23 C 73 F						
Set to touch, hours	---	---	---	---	---	18
Dry-hard time, hours	---	---	---	---	---	24
Sag resistance (ASTM D4400)						
Micrometers	---	---	---	---	304	---
Mils	---	---	---	---	12	---
Pot life, minutes 600 grams at 73 F23 C (via x2 viscosity)	---	---	---	---	90	---
Color of dry film Approximate FED-STD-595 Off White, and be no darker than color 27778	---	---	---	---	Conform	
Contrast ratio, White (ASTM D2805) at 127 micrometers 5 mils DFT	---	---	---	---	0.95	---
DFT Gloss, (ASTM D523) 60 degree specular	---	---	---	---	50	---
VOC * (ASTM D3960)						
Grams per liter, Mixed	---	---	---	---	< 50	
Pounds per gallon, Mixed	---	---	---	---	<.42	
Total Lead & Cadmium (ASTM D3335)	---	---	---	---	<.0006 percent	

TABLE I						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Non-Zinc Epoxy Barrier Coating, Flexible						
Test	Componenent A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Total Chromium (ASTM D3718)	---	---	---	---	<.0006 percent	
Fourier tansform infrared spectroscopy (FTIR)					Conform plus or minus 10 percent	
Match Manufacturer's Qualification FTIR test scans to Component "A" Liquid (ASTM D7588) Component "B" Liquid (ASTM D7588)						

Table II	
COATING QUALIFICATION INSPECTION REQUIREMENTS	
Non-Zinc Epoxy Barrier Coating, Flexible	
Physical Properties	Acceptance Criteria
Solids, by weight(ASTM D2369), Method E	>97 percent
Mix Ratio (by volume) (Components A and B) Not a requirement	1:1
Pigment content, percent wt (ASTM D2698)	
Component A	17 .0 max.
Component B	32.0 min.
Total Components A and B	28.0 max.
Titanium dioxide content, percent of pigment, Type IV, V (ASTM D476)	> 41 percent
Volatiles, percent wt (ASTM D2369)	
Component A	2.0 max.
Component B	2.0 max.
Mixed	3.0 max.
Non-volatile vehicle, percent wt. (by computation)	
Component A	82.0 min. 87.0 max.
Component B	65.0 min. 70.0 max.
Pot Life (600 grams at 73 F23 C), Minimum (via x2 viscosity)	90 minutes
Sag resistance, minimum (ASTM D4400)	
Micrometers	304
Mils	12
Color of dry film Approximate FED-STD-595 Off White, and be no darker than color 27778	Conform
Contrast ratio, White (ASTM D2805) at 127 micrometers 5 mils	0.95 min.
Gloss, (ASTM D523) at 127 micrometers 5 mils DFT	50 min.
Flash Point, Components A & B, Degrees F, (Degrees C), by one of the following methods: (ASTM D3278), (ASTM D93) or (ASTM D56)	> 200 F 93.3 C
VOC * (ASTM D3960)	
Grams per liter	< 50 max.
Pounds per gallon	<.42 max.
Viscosity, Brookfield mPa-s (cp) (ASTM D2196), Test Method A, 10 rpm, Spindle 2	
Mixed (Components A and B) at 77 F 25 C	5500 - 7000
Total Lead & Cadmium (ASTM D3335)	<.0006 percent

Table II	
COATING QUALIFICATION INSPECTION REQUIREMENTS	
Non-Zinc Epoxy Barrier Coating, Flexible	
Physical Properties	Acceptance Criteria
Total Chromium (ASTM D3718)	<.0006 percent
Weight (ASTM D1475)	
Component A, Kilograms per liter	1.08 - 1.23
Component B, Kilograms per liter	1.38 - 1.53
Mixed, Kilograms per liter	1.23 - 1.38
Component A, Pounds per gallon	9.0 - 10.25
Component B Pounds per gallon	11.50 - 12.75
Mixed, Pounds per gallon	10.25 - 11.50
Dry Time, (ASTM D1640), at 73 F 23 C	
Set to touch, hours	18 max.
Dry-hard time, hours	24 max.
Tensile Strength (psi) (ASTM D2370)	> 800
Elongation at break (ASTM D2370)	> 40
Hardness (Shore D), 14 Days Cure (ASTM D2240)	> 30
Adhesion, Steel (ASTM D4541), Test Method E, psi	≥ 2,500
Direct Impact Resistance, in/lbs (ASTM D2794)	> 100
Test No. 1, ASTM B117 Salt Fog Resistance Test, Complete System Blisters, 4,000 hrs., No.6/Medium ≥ 7 Rust 5,000 hrs. < 5 mm	
Test No. 2 ASTM D5894 Cyclic Weathering Resistance Test, Complete System Delta E, 5,000 hrs. < 2 Gloss Value 5,000 hrs. ≥ 72 Gloss Retention 5,000 hrs. ≥ 90 percent	
Test No. 3 ASTM D4060 Abrasion Resistance Test, Complete System Weight Loss, milligrams, 1,000 Cycles < 0.1 mg	
Test No. 4 ASTM D4541 Adhesion Test, Test Method E, psi Non-Zinc Epoxy Barrier Coating > 2,500	
Test No. 5 ASTM D6944 Freeze Thaw Stability, Complete System See Test No. 4, except for test variation allowed by ASTM D4541	
Test No. 6 ASTM D7588 Coating Identification Tests FT/IR - upon confirmation of product conformity to requirements, produce a set of three FT/IR scans to be used to assess conformity of all subsequent batches of this material, as follows: (1) Component A Liquid, (ASTM D7588) (2) Component B Liquid, (ASTM D7588) (3) Mixed (Components A and B) Dry Film (0.01 - 0.03g coating in 0.5 g KBr)	

TABLE IA						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Fluoropolyurethane Topcoat						
Test	Componenent A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Solids, by weight(ASTM D2369), Method D						52 percent
Viscosity, Brookfield, mPa-s (cp) (ASTM D2196), Test Method A, 100 rpm, Spindle 3, Mixed (Comp. A & B) at 25 C 77 F					90	
Viscosity, Krebs Units ASTM D562					50	
Weight ASTM D1475						
Kilograms / liter	1.59	1.70	1.14	1.26	1.55	1.68
Pounds / gallon	13.25	14.25	9.50	10.50	13.00	14.00
Fineness of grind,Hegman (ASTM D1210)	6	---	6	---	6	---
Dry Time (ASTM D1640), at 23 C 73 F						
Set to touch, hours	---	---	---	---	---	2
Dry-hard time, hours	---	---	---	---	---	12
Sag resistance (ASTM D4400)						
Micrometers	---	---	---	---	76	---
Mils	---	---	---	---	3	---
Pot life, hours 600 grams at 73 F 23 C (via x2 viscosity)	---	---	---	---	4	---
Color of dry film FED-STD-595 White, No. 17925 or No. 17875, Beige No. 27769(Gloss), Orange No. 12197	---	---	---	---	Conform	
Contrast ratio, White (ASTM D2805) at 127 micrometers 5 mils DFT	---	---	---	---	0.95	---
DFT Gloss, (ASTM D523) 60 degree specular	---	---	---	---	85	---
VOC * (ASTM D3960)						
Grams per liter, Mixed	---	---	---	---	< 50	
Pounds per gallon, Mixed	---	---	---	---	<.42	

TABLE IA						
COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS						
Fluoropolyurethane Topcoat						
Test	Componenent A		Component B		Mixed	
	Min.	Max.	Min.	Max.	Min.	Max.
Total Lead & Cadmium (ASTM D3335)	---	---	---	---	<.0006 percent	
Total Chromium (ASTM D3718)	---	---	---	---	<.0006 percent	
Fourier tansform infrared spectroscopy (FTIR)					Conform plus or minus 10 percent	
Match Manufacturer's Qualification FTIR test scans to Component "A" Liquid (ASTM D7588) Component "B" Liquid (ASTM D7588)						

Table IIA	
COATING QUALIFICATION INSPECTION REQUIREMENTS	
Fluoropolyurethane Topcoat	
Physical Properties	Acceptance Criteria
Solids, by weight(ASTM D2369), Method D	>52 percent
Mix Ratio (by volume) (Components A and B) - Not a requirement	7:1
Pigment content, percent wt (ASTM D2698)	
Component A	25.0 max.
Component B	---
Total Components A and B	24.0 min.
Titanium dioxide content, percent of pigment, Type IV, V (ASTM D476)	> 90 percent
Volatiles, percent wt (ASTM D2369)	
Component A	49.0 max.
Component B	17.0 max.
Mixed	47.0 max.
Non-volatile vehicle, percent wt. (by computation)	
Component A	20.0 min.
Component B	80.0 min.
Pot Life (600 grams at 23 C 73 F), Minimum (via x2 viscosity)	4 hours
Sag resistance, minimum (ASTM D4400)	
Micrometers	76
Mils	3
Color of dry film	Conform
Contrast ratio, White (ASTM D2805) at 50.8 micrometers 2 mils	0.95 min.
Gloss, (ASTM D523) at 50.8 micrometers 5 mils DFT	85 min.
Flash Point, Components A & B, Degrees F, (Degrees C), by one of the following methods: (ASTM D3278), (ASTM D93) or (ASTM D56)	> 100 F 37.8 C
VOC * (ASTM D3960)	
Grams / liter	< 50 max.
Pounds / gallon	<.42 max.
Viscosity, Brookfield mPa-s (cp) (ASTM D2196), Test Method A, 10 rpm, Spindle 2	
Mixed (Components A and B) at 77 F 25 C	90 min.
Viscosity, Krebs Units ASTM D562	50 min.
Total Lead & Cadmium (ASTM D3335)	<.0006 percent
Total Chromium (ASTM D3718)	<.0006 percent
Weight (ASTM D1475)	

Table IIA	
COATING QUALIFICATION INSPECTION REQUIREMENTS	
Fluoropolyurethane Topcoat	
Physical Properties	Acceptance Criteria
Component A, Kilograms per liter	1.59 - 1.70
Component B, Kilograms per liter	1.14 - 1.26
Mixed, Kilograms per liter	1.55 - 1.68
Component A, Pounds per gallon	13.25 - 14.25
Component B Pounds per gallon	9.50 - 10.50
Mixed, Pounds per gallon	13.00 - 14.00
Dry Time, (ASTM D1640), at 23 C 73 F	
Set to touch, hours	2 max.
Dry-hard time, hours	12 max.
Tensile Strength (psi) (ASTM D2370)	> 800
Elongation at break (ASTM D2370)	> 30
Hardness (Shore D), 14 Days Cure (ASTM D2240)	> 30
Adhesion, Non-Zinc Epoxy Barrier Coating (ASTM D4541), Test Method E, psi	$\geq$ 1,450
Direct Impact Resistance, in/lbs (ASTM D2794)	> 100
Test No. 1, ASTM B117 Salt Fog Resistance Test, Complete System Blisters, 4,000 hrs., No.6/Medium $\geq$7 Rust 5,000 hrs. < 5 mm	
Test No. 2 ASTM D5894 Cyclic Weathering Resistance Test, Complete System Delta E, 5,000 hrs. < 2 Gloss Value 5,000 hrs. $\geq$ 72 Gloss Retention 5,000 hrs. $\geq$ 90 percent	
Test No. 3 ASTM D4060 Abrasion Resistance Test, Complete System Weight Loss, milligrams, 1,000 Cycles, < 0.1 mg	
Test No. 4 ASTM D4541 Adhesion Test, Test Method E, psi Non-Zinc Epoxy Barrier Coating Fluoropolyurethane Topcoat $\geq$ 1,450	
Test No. 5 ASTM D6944 Freeze Thaw Stability, Complete System See Test No. 4, except for test variation allowed by ASTM D4541	
Test No. 6 ASTM D7588 Coating Identification Tests FT/IR - upon confirmation of product conformity to requirements, produce a set of three FT/IR scans to be used to assess conformity of all subsequent batches of this material, as follows: (1) Component A Liquid, (ASTM D7588) (2) Component B Liquid, (ASTM D7588) (3) Mixed (Components A and B) Dry Film (0.01 - 0.03g coating in 0.5 g KBr)	

COATING QUALIFICATION INSPECTION REQUIREMENTS
TEST PANEL PREPARATION AND TEST

The Principal Testing Firm performing the testing must be responsible for application of protective coatings to test panels. The final report must include testing results for all samples, panels, or tests performed. The final report must be certified by the Testing Firm and kept by the manufacturer as proof of testing and conformance. Include all of the laboratory testing requirements.

Test Panel Requirements for Test (Applicable to Test Nos. 1 through 5)

All steel test panels, except Test No. 3 panels, must be ASTM A36/A36M, hot -rolled steel or equivalent with dimensions (in mm) as shown below. Certified mill test reports must be provided as prepared by the steel manufacturer or testing laboratory for all Grade 36 steel identifying actual physical and chemical analysis of the material. Test panels for Test No. 3 must be standard Taber panels, meeting the requirements of ASTM D4060.

Test Panel Dimensions (in mm)

Test	Width	Length	Thickness
1,2,4,5	100	150	6

Three test panels must be prepared for each complete system for each test. Test 4 requires three additional test panels to be prepared with the primer only. Control panels must be coated in bulk lots by a single applicator for use by all selected laboratories. The location and date of application must be reported. All control panels utilized during the testing evaluation of a system must be from the same lot. During transportation and storage, control panels must be protected such that coating damage will not occur. Beyond 30 days, the storage temperature and relative humidity for these panels must be 25 plus or minus 5 degrees C and 50 plus or minus 20 percent.

Suggested Acceptance Criteria-Two of three panels must pass for the complete system to pass. Acceptance criteria are included for interpreting data reported.

The panels must be cleaned in accordance with SSPC SP 5/NACE No. 1 using recyclable metallic abrasives in accordance with SSPC AB 3. The abrasives must have a maximum chloride content of 15 ppm determined in accordance with ASTM D512 and a maximum conductivity of 150 micromhos per cm determined in accordance with ASTM D4940. The abrasive mixture must be approximately 60 percent SAE shot number S230 and 40 percent SAE grit number G40. Both the shot and grit must have a Rockwell hardness of C45 plus or minus 3. The surface profile of the cleaned panels must be 40 to 65 micrometers (1.5 to 2.5 mils) when determined in accordance with ASTM D4417, Method C. The profile must be clean, sharp and free of embedded friable material, with adequate roughness to insure effective adhesion of the applied primer.

Note: The SSPC SP 5/NACE No. 1 is required rather than SSPC SP 10/NACE No. 2 only for the convenience of the laboratory in order to guarantee that all panels are prepared identically and to assure comparative testing results. Steel surfaces prepared to a lesser degree may not yield same performance.

Each coating must be applied within the dry film thickness range recommended by the manufacturer. All products must be applied using proper airless equipment except when this method is specifically not allowed by the paint manufacturer. All paints must be applied to panels mounted vertically at a distance 530 mm (21 in.) from the tip of the spray gun. The equipment must be capable of developing sufficient pressure to properly atomize the coating. Orifice size, application pressure, pump type and ratio, hose size and length, and any atypical application requirements must be recorded. If the pressure used varies by more than 10 percent from the suggested pressure listed in the manufacturer's application data information, the actual pressure used and a statement explaining the deviation must be provided in the final report.

For testing purposes the color of the final topcoat must conform to FED-STD-595, Color Chip No. 17925 (White) and the color of the primer coat must be of a contrasting color.

Each sample or panel must be marked and identified by an assigned system code number. The identification code number must be placed on the back of each panel with permanent yellow paint stick. It will also be typed and placed in front of the corresponding panel when photographs are taken. The number will have a minimum height of 10 mm and will identify the following information, which will be part of the final report:

1. Test number being performed. (i.e., Salt No. 1, Abrasion No. 3).
2. Replica test being performed (i.e., Salt Replica 3, Abrasion Replica 2)
3. Date of panel preparation.
4. Date that the test evaluation was performed.

Test panels coated with the primer only and panels coated with the primer plus topcoat must be top coated at the minimum recoat time frame stated in the product data sheet. Curing of the coated test panels, including control panels for the complete system, must be a minimum of 30 days and no more than 45 days. The curing climate must be at 25 plus or minus 2 degrees C and 65 plus or minus 5 percent relative humidity. The back of all test panels must be coated with 75 to 100 micrometers of a high-quality epoxy or urethane barrier coat.

After preparation of the test panels with the coating system to be evaluated the edges must be sealed and protected by applying vinyl tape around the entire outside edge. The vinyl tape must extend 5 mm onto the coated surface from the edge of the panel and must be applied after the coating has cured. The vinyl tape must meet the requirements of CID A-A-1689 and have an approximate vinyl thickness of 110 micrometers with an approximate neoprene adhesive thickness of 25 micrometers.

Test panels must be scribed in accordance with ASTM D1654 with a single "X" mark centered on the panel. The rectangular dimensions of the scribes must have a top width of 50 mm and a height of 100 mm. The scribing tool must be a straight-shank tungsten carbide tip, lathe cutting tool (ANSI B94.50, Style E). The scribe cut must expose the steel substrate as verified with a microscope.

Photographic Requirements (Applicable to Test Nos. 1 through 5).
Color photographs of each sample or panel must be taken as follows:

1. All photographs must include the code identification number for each sample or panel and the number of hours.
2. A photograph of the coated surface of each sample or panel must be taken after the application of the entire system to be evaluated.

Test No. 1 and No. 2:
1. Each time frame designated.
2. Once blistering or rusting is observed, the panel must be photographed and its condition documented at the end of each 336 -hour cycle for the ASTM D5894 Cyclic Weathering Resistance Test and 1,000 hours for ASTM B117 Salt Fog Resistance Test.
3. Rust creepage evaluation: (1) after washing and prior to stripping of the scribe, and (2) after stripping of the scribe.

Test Nos. 3, 4, and 5 At the completion of each test. Measurement of Surface Profile and Dry Film Paint Thickness (Applicable to Test Nos. 1 through 5).

1. Surface Profile-Measure the total surface profile thickness using a Testex kit in accordance with ASTM D4417, Method C.
2. Dry Film Paint Thickness-The dry film paint thickness must be taken in accordance with ASTM D7091, with the following exception:
   A.) Measure the dry film paint thickness on each test panel utilizing a Type II dry film thickness gage calibrated according to SSPC PA 2 as follows:
   a.) Take two gage readings from the top third, the middle third, and the bottom third of the test panel. Readings should be taken at least 25 mm from any edge. To facilitate consistent measurements at fixed positions on the panel, the laboratory must use a template, providing six fixed locations on the panels. Discard any gage reading that cannot be repeated consistently. The average of the acceptable gage readings must be no less than the manufacturer's recommended minimum thickness. No single gage reading must be less than 80 percent of the manufacturer's recommended minimum. The average of the acceptable gage readings must be no more than the manufacturer's recommended maximum thickness. No single gage reading must be more than 120 percent of the manufacturer's recommended maximum. Recommended maximum dry film thickness must be detailed on the manufacturer's product bulletin of each product.

TESTS TO BE PERFORMED

Test No. 1 ASTM B117 Salt Fog Resistance Test.

A salt fog resistance test must be performed in accordance with ASTM B117. The complete system must be exposed for durations of 4,000 and 5,000 hours.

Evaluation-Full visual evaluations must be performed at the intermediate and final hours shown above. Rust creepage at the scribe and percent rusting at the scribed edges must be evaluated at intermediate hours and after scraping at 5,000 hours in accordance with ASTM D1654, Method 2, Scraping, (where applicable after cleaning). Blistering, rust creepage at the scribe, percent rusting at the scribed edges and a description of rusting in the scribe must be reported in table format. Test values must not exceed the Test Acceptance Criteria listed below, except percent rusting at the scribed edges, which will be reported for information only.

Blistering must be evaluated in accordance with ASTM D714. Blister size and frequency must be converted to a numerical value using Table A.

Blister Value Conversion Table				
(No blisters equals a conversion number of 10.)				
Blister Size	Blister Frequency			
---	Few*	Medium	Medium Dense	Dense
No. 8	9	8	7	6
No. 6	8	7	6	5
No. 4	7	6	5	4
No. 2	6	5	4	3
No. 2	5	4	3	2
*Adjustment Values for "Few"				
Number of Blisters	Value			
1	plus 0.8			
2	plus 0.6			
3	plus 0.4			
4	plus 0.2			
≥5	plus 0.0			
If a specific number of blisters are reported under the frequency "Few" then use the appropriate decimal "Value" provided above. Example: A report of two No. 6 blisters converts to a value of 8.6.				

Rust Creepage at the Scribe
Rust creepage (a.k.a. cutback, undercut, loss of adhesion, deterioration, disbondment) must be measured perpendicular from the center of the scribe to the furthest point of cutback. Cutback must be measured in millimeters to the nearest 0.5 mm. For both intermediate and final evaluations, the maximum cutback must be measured at 5 mm intervals along the scribe on each side of the scribe. (For a 50 x 100 mm X-scribe, 23 measurements are required for each side of each leg of the X-scribe). Report the average and maximum cutback measurements. Defects at the scribe having the appearance of a "blister" will be defined to be rust creepage (cutback).

Percent Rusting at the Scribed Edges
The length of individual areas of rust creepage along both edges of the scribe measured in Rust Creepage at the Scribe (above) must be added together to achieve an aggregate length of rust creepage. This length of rusting must be divided by the total length of the scribe on both sides to yield a percent of rusting at the scribed edges. [e.g., (length of rust along both sides of scribe), (total length of scribe, which is 2 x 2 x 111.8 mm equaling 447.2 mm) = (percent rusting at the scribed edges)].

Rusting in the Scribe
In addition to the measurement of rust creepage in Rust Creepage at the Scribe (above) and Percent Rusting at the Scribed Edges (above) a general description of rusting in the scribe itself will also be reported. This description will state whether the scribe is "clean, partially rusted, or completely rusted."

Suggested Acceptance Criteria
After the designated hours of exposure, the coating must exhibit no spontaneous delamination (evaluated subjectively). Percent rusting at the scribe must be reported as information only. Blistering, and both average and maximum rust creepage at the scribe, must not exceed the following acceptance levels:

	Test Acceptance Criteria					
	Blister Criteria			Rust Criteria		
Conversion Acceptance	Creepage Hours	Size/Freq.	Value	Hours	Max	Avg.
Complete System	4000	No. 6 Medium	$\geq$ 7	5000	< 5 mm	

Test No. 2 ASTM D5894 Cyclic Weathering Resistance Test

A cyclic weathering resistance test must be performed in accordance with ASTM D5894 for the following durations:

	Test Panel Cycle Requirements (Number of 336 hour Cycles)				
Test panels: Complete System	3	6	9	12	15

Color change testing must be performed in accordance with ASTM D2244 to obtain calculations of color differences from instrumentally measured color coordinates CIE 1976 L*a*b*. Testing must be performed in accordance with ASTM E 1349 using Illuminant D 65 and two-degree observer. Report color changes as Delta E cmc. Specular gloss retention must be performed in accordance with ASTM D523 using an incidence angle of 60 degrees.

	Final Test Acceptance Criteria		
Acceptance	Hours / Color	Gloss Value	Gloss Retention
Complete System	5000 / Delta E < 2	$\geq$ 72	$\geq$ 90 percent

Evaluation
Follow evaluation procedures of Rust Creepage at the Scribe (above). All testing intervals must be evaluated.

Acceptance Criteria
After the designated hours of exposure the coating must exhibit no spontaneous delamination or blistering (evaluated subjectively). After scraping at 5,000 hours in accordance with ASTM D1654, Method 2, Scraping, (where applicable after cleaning). Percent average rust creepage at the scribe must be reported. Acceptance: must not exceed - Average 14 mm.

Test No. 3 ASTM D4060 Abrasion Resistance Test

A test for abrasion resistance must be performed in accordance with ASTM D4060 using a CS-17 wheel and 1 kg weight for 1,000 cycles. The test must be performed on panels coated with the full system to be tested (i.e., primer/topcoat). The hardness of the abrasive wheel must be checked in accordance with ASTM D2240 for each test performed.

Acceptance Criteria
The system must be tested to identify its "weight loss" in milligrams. Acceptance: < 0.1 mg

Test No. 4 ASTM D4541 Adhesion Test

A test for adhesion must be performed in accordance with ASTM D4541, Test Method D, using apparatus under Appendix D. The adhesive used to perform this test must be a two-component epoxy, containing no solvents (e.g., 100 percent solids). The test must be performed on panels having the primer coat only and on panels having the complete system. A minimum of four tests must be performed on each panel.

Acceptance Criteria
1. System with Non-Zinc Epoxy Barrier Coating, Flexible primer must meet a minimum value of 17.24 Mpa (2,500 psi).

2. System with Non-Zinc Epoxy Barrier Coating, Flexible primer and Fluoropolyurethane Topcoat must meet a minimum value of 10.0 Mpa (1,450 psi).

Test No. 5 ASTM D6944 Freeze Thaw Stability

The test must be performed on panels coated with the full system to be tested (i.e., primer/topcoat). Prepared panels must be exposed to a 30-day freeze/thaw/immersion cycle ASTM D6944, Test Method A. One 24-hour cycle must consist of 16 hours at approximately -30° ± 5°C followed by four hours of thawing at 50° ± 5°C and four hours tap water immersion at 25° ± 2°C. This work is done with the panels remaining in the freezer mode on weekends and holidays. Upon completion of the test, adhesion tests must be performed as required in Test No. 4.

Acceptance Criteria
Tests must indicate that there has been no loss in the adhesion values, when compared with those obtained in Test No. 4, for the complete system, which exceeds the test variation allowed by ASTM D4541.

Test No. 6 ASTM D7588 Coating Identification Tests.

An analysis of vehicle solids by Fourier transform infrared (FT/IR) spectroscopy consisting of 16 scans minimum per sample must be performed as follows:

1. For the Non-Zinc Epoxy Barrier Coating, Flexible primer solvent-based coat, infrared spectrum (2.5 to 15 micrometers) of each liquid vehicle component via the potassium bromide sandwich technique.

2. For two-component, Fluoropolyurethane solvent-based topcoat infrared spectrum (2.5 to 15 micrometers) of each component via the potassium bromide sandwich technique, and of the mixed and dried components in appropriate mixing ratios (dried film) via the potassium bromide single-pellet technique, or alternately by the IR card sampling technique, which is called the polymer-coated fiberglass screen or transparent film (PTFE) technique.

The Volatile Organic Compound (VOC) content must be determined in accordance with ASTM D3960. Multi-component coatings will be blended together in the specified mixing ratios prior to testing.

Any products may be qualified by providing independent testing results to the requirements in this table. Coating Systems that currently meet these requirements and do not require COATING QUALIFICATION INSPECTION testing until January 01, 2018 include the following products only:

Premier Coating Systems, Inc (904)824-1799 Phone, (904)403-6113 Cell
- PCS-No. 1111 Epoxy Barrier Coating
- PCS-No. 4300 FPU (Fluoropolyurethane) Pigmented, Exempt

TABLE III
Reporting Program Requirements QA/QC

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/ disable access for users.

All enabled users must view the same active report in real time. There must be no opportunity for multiple versions of the same report to exist.

Administrators must be able to setup unique approval processes for each project and promote or remove unique people from this process at any time.

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

Administrators must be able to associate PDS, MSDS, 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.

The program / hardware package must be able to communicate with inspection devices that provide (batch) data export capability such as Elcometer and Defelsko gages.

Must automatically time, date and GPS stamp all reports without input or interference from the inspector.

Real Time Syncing:

Forms must be available for approved associates to view at all times.

Retrievable storage must be provided for all job related reports and documents for a minimum time of 5 years from completion of the job or project. Archiving of the documents after 5 years will be the responsibility of the Government.

Document Library:

All reports must be in searchable and annotatable PDF format.

The Administrator must be able to upload and annotate job specific reports in real time. Examples include but not limited to Material Safety Data Sheets, Product Data Sheets and Blueprints.

Annotations / 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.

TABLE III
Reporting Program Requirements QA/QC

Customization:

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

-- End of Section --