

Preparing Activity: NAVFAC

Superseding
UFGS-09 97 13.27 (February 2021)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2022

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SECTION 09 97 13.27

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05/22

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UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 09 97 13.27

HIGH PERFORMANCE COATING FOR STEEL STRUCTURES 05/22

NOTE: This guide specification covers the requirements for zinc-rich epoxy/epoxy/polyurethane and epoxy/polyurethane coating systems for the following:

1. New steel components in atmospheric service (non-immersion) which require the highest performance available to address severe environments, or where life-cycle costs are justified to avoid facility shutdowns for future re-coatings; or where finish application degradation, such as peeling, which jeopardizes assets within a facility. This includes, but is not limited to, aboveground fuel tanks, water tanks, and piping; components identified in UFC 4-211-01 Aircraft Maintenance Hangars, cranes, and towers.
2. New structures and coating of existing structures where all existing coating material is being removed to bare metal.
3. Newly purchased equipment and replacement equipment including, but not limited to, valves, piping, filters, supports, structural steel, and Marine Loading Arms (MLAs), that may be replaced due to mechanical or corrosion failure. When purchasing these items, alert suppliers to the coating requirements. Unknown shop primers must be removed and replaced prior to being placed into service.
4. Repairing and coating of galvanized surfaces. Repair galvanizing with the zinc-rich primer, and apply general coats of intermediate and topcoat to all surfaces.

Coordinate surface preparation and coating systems with applicable Division 05 and Division 08 UFGS Sections.

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

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

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

NOTE: 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. If existing conditions are not known, proper (effective and financially supportable) surface preparation or coating system selection cannot be made.

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

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

NOTE: SSPC and NACE have merged to become AMPP. The merger was still in progress at the time this section was released.

NOTE: The metric standard for measuring coating thickness is microns (25.4 microns=1 mil; use nominal 25 microns=1 mil).

NOTE: This specification is for an industry standard, three-coat, thin-film, coating system that

is compliant with EPA Volatile Organic Compounds (VOC) regulations as of August 2021:

- Epoxy coats 350 grams per liter (g/L) 2.8 pounds per gallon (lbs/gal) maximum VOC
- Polyurethane Topcoat 350 grams per liter (g/L) 2.8 pounds per gallon (lbs/gal) max. VOC

The designer must review state and local, regulations and determine whether the coating in this Section complies with restrictions on VOC and other chemical constituents.

NOTE: Tailor the SURFACE PREPARATION paragraph and subparagraphs to the needs of cleaning that will be required in preparation for repairs, and note that the abrasive blasting for inspection should be accomplished in such a manner that it does not conflict with any surface condition requirements in this Section, such as creating excessive surface profile that may require excessive primer thickness. For repair projects, specify appropriate portions of the steel surfacing requirements (according to NACE RP0178) from Section 33 56 21.17 SINGLE WALL ABOVE GROUND FIXED ROOF STEEL POL STORAGE TANK.

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.

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

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

PART 1 GENERAL

1.1 REFERENCES

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

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

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

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 C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D1200	(2010; R 2014) Viscosity by Ford Viscosity Cup
ASTM D1640/D1640M	(2014) Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings
ASTM D3276	(2015; E 2016) Standard Guide for Painting Inspectors (Metal Substrates)
ASTM D3335	(1985a; R 2020) Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D3718	(1985a; R 2015) Low Concentrations of Chromium in Paint by Atomic Absorption Spectroscopy
ASTM D3925	(2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D4285	(1983; R 2018) Indicating Oil or Water in Compressed Air
ASTM D4417	(2021) Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM E11	(2020) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 8502-3	(2017) Preparation of Steel Substrates Before Application of Paints and Related Products - Tests for the Assessment of Surface Cleanliness - Part 3: Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure-Sensitive Tape Method)
ISO 9001	(2015) Quality Management Systems-Requirements

MASTER PAINTERS INSTITUTE (MPI)

MPI 515	(2020) Non-Zinc, Epoxy Barrier Coating, Flexible
MPI 516	(2020) Fluoropolyurethane, Steel Structure Exterior, Topcoat

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC AB 1	(2015; E 2017) Mineral and Slag Abrasives
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SSPC AB 2	(2015; E 2016) Cleanliness of Recycled Ferrous Metallic Abrasive
SSPC AB 3	(2003; E 2004) Ferrous Metallic Abrasive
SSPC Guide 6	(2015) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations
SSPC Guide 12	(1998; E 2004) Guide for Illumination of Industrial Painting Projects
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC PA 2	(2015; E 2018) Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC QP 1	(2019) Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors (Field Application to Complex Industrial Steel Structures and Other Metal Components)
SSPC QP 2	(2019) Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors (Removal of Hazardous Coatings from Structures)
SSPC QP 5	(2012) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC QS 1	(2015) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC SP 11	(2012) Power Tool Cleaning to Bare Metal
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS-STD-595A	(2017) Colors used in Government Procurement
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U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-DTL-24441	(2009; Rev D; Notice 1 2021) Paint, Epoxy-Polyamide, General Specification for
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MIL-DTL-24441/19	(2009; Rev C) Paint, Epoxy-Polyamide, Zinc Primer, Formula 159, Type III
MIL-DTL-24441/31	(2009; Rev B; Notice 1 2021) Paint, Epoxy-Polyamide, White, Formula 152, Type IV
MIL-PRF-85285	(2012; Rev E; Notice 1 2016) Coating: Polyurethane Aircraft and Support Equipment
MIL-STD-161	(2005; Rev G; Notice 1 2010) Identification Methods for Bulk Petroleum Products Systems Including Hydrocarbon Missile Fuels

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

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

1.2 DEFINITIONS

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

- a. INDEPENDENT THIRD-PARTY - Impartial third-party not a part or affiliated with Contractor or subcontractor principal or subsidiary businesses, and not a materials supplier.
- b. STRIPE COAT - An additional corrosion protection measure on edges, outside corners, crevices, bolt heads, welds, and other irregular surfaces, including minor surface preparation on sharp edges.

1.3 SUBMITTALS

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

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the

Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

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

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

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

SD-01 Preconstruction Submittals

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Corrective Action Request (CAR) Form

Coatings Work Plan

Inspection Report Forms

SD-05, Design Data

Containment System

SD-06 Test Reports

Coatings Qualification Test Reports

Joint Sealant Qualification Test Reports

Ferrous Metallic Abrasive Qualification Test Reports

Non-Metallic Abrasive Qualification Test Reports

Coating Field Test Reports

Abrasive Field Test Reports

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

Daily Inspection Reports

SD-07 Certificates

Qualifications of Certified Industrial Hygienist (CIH)
Qualifications of Protective Coatings Specialist (PCS)
Qualifications of Coatings Inspection Company
Qualifications of Quality Assurance Coatings Inspector
Qualifications of Coatings Contractor Company
Qualifications of Individuals Performing Abrasive Blasting
Qualifications of Individuals Applying Coatings
Qualifications of Testing Laboratory for Coatings
Qualifications of Testing Laboratory for Abrasive
Coating Materials Certificate of Conformance
Joint Sealant Materials Certificate of Conformance
Joint Sealant Compatibility
Non-Metallic Abrasive Certificate of Conformance
Ferrous Metallic Abrasive Certificate of Conformance

SD-08 Manufacturer's Instructions

Joint Sealant Instructions
Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive
Inspection Logbook; G[, [____]]
Corrective Action Log; G[, [____]]

1.4 QUALITY ASSURANCE

1.4.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents to the Contracting Officer within 30 days of contract award for all work covered in this Section. All such discrepancies must be addressed and resolved, and the Coatings Work Plan modified, prior to beginning the Initial and Follow-Up phases of work.

Discrepancies that become apparent only after work is uncovered must be identified at the earliest discoverable time and submitted for resolution. Schedule time (float) must be built into the project schedule

at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.4.2 Corrective Action (CA)

CA must be included in the Contractor Quality Control Plan as outlined in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL.

1.4.2.1 Corrective Action Procedures

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

1.4.2.2 Corrective Action Request (CAR) Form

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

1.4.2.3 Corrective Action Log

When a CAR is initiated, Contractor must take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These actions must apply to non-compliance in the work and to non-compliance in the Quality Control (QC) System. Corrective actions must be appropriate to the effects of the non-compliance encountered. The corrective action must be documented in a report that is serialized and tracked in the Corrective Action Log until project completion and its acceptance by the Contracting Officer. All corrective action reports must be retained in project records. The Corrective Action Log, showing status of each CAR, must be submitted to the Contracting Officer monthly.

1.4.3 Coatings Work Plan

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.

NOTE: Ensure coordination between all parties, including the welder, weld inspector, coatings Contractor, Quality Assurance Coatings Inspector, and Coatings Contractor QC Coatings Inspector, on weld preparation and surface profile requirements.

The Coatings Work Plan must be considered as part of the Contractor Quality Control Plan as outlined in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL.

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

- a. Purpose;
- b. Introduction[(including the scope of work (SOW) project program)];
- c. Safety, fire, and health information;
- d. Contractor and worker qualifications with certifications;
- e. Project management organization and documents;
- f. Timeline in a Gantt chart;
- g. Project document references;
- h. Reference to all applicable standards (e.g., AMPP, NACE, SSPC, ISO, and ASTM);
- i. Coatings manufacturer's supporting documentation;
- j. Descriptions and explanations of any exceptions from the coating manufacturer;
- k. Coating and blasting equipment, model names, and, if applicable, calibration dates;
- l. Containment design and details;
- m. Environmental testing;
- n. Material delivery, storage, and handling details;
- o. Surface preparation[(include procedures for if the pre-existing anchor profile is greater than 100 microns 4 mils as specified in paragraph ABRASIVE BLASTING)];
- p. Pre-application test panel validation for field-applied external coating as outlined in SURFACE STANDARD;
- q. Coating materials, mixing, application, recoat windows, and coating curing times, if applicable;
- r. Coating repairs and rework;
- s. Non-conformance;
- t. Spent material handling and effluent discharge containment and disposal;

- u. Inspection test plan (as outlined in FIELD INSPECTION, and including inspection hold points, both Quality Assurance and Coating Contractor QC Coatings Inspector's responsibilities, and daily documentation and delivery);
- v. Instruments and test kits;
- w. Warranty (in writing, signed by the Contractor and the coating manufacturer's representative);
- x. Demobilization;
- y. PCS and PM approval.

1.4.4 Design Data

1.4.4.1 Containment System

Submit complete design drawings and calculations for the scaffolding and containment system as described in paragraph CONTAINMENT, 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 Coatings Qualification Test Reports

NOTE: Bracketed options are for the zinc-rich epoxy/epoxy/polyurethane coating system and the epoxy/polyurethane coating system. Only one coating system is to be used. Remove the bracketed portion pertaining the coating system that will not be used for this project.

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

[The purpose of qualification testing is to pre-qualify the coating materials to MIL-DTL-24441 for the epoxy materials and MIL-PRF-85285 for the polyurethane materials. Submit test results for epoxy materials in conformance to the requirements of MIL-DTL-24441. Submit results for polyurethane materials in conformance to the requirements of MIL-PRF-85285, and as revised by paragraph POLYURETHANE TOPCOAT herein. Note that this is the same testing that is required for listing on the Qualified Products List (QPL) for each coating type. The coating materials must remain on the QPL for the entire project.

]The purpose of qualification testing is to pre-qualify the coating materials to MPI 515 for the epoxy materials and MPI 516 for the polyurethane materials. Submit test results for epoxy materials of conformance to the requirements of paragraph 8 TESTING REQUIREMENTS AND DETAILS in MPI 515. Submit results for polyurethane materials of conformance to the requirements of paragraph 8 TESTING REQUIREMENTS AND DETAILS in MPI 516. Note that this is the same testing that is required

for qualification to MPI. The coating materials must remain qualified for the entire project.

1.4.5.2 Joint Sealant Qualification Test Reports

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

1.4.5.3 Ferrous Metallic Abrasive Qualification Test Reports

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

1.4.5.4 Non-Metallic Abrasive Qualification Test Reports

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

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

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

1.4.6 Qualifications

1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)

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

1.4.6.2 Qualifications of Protective Coatings Specialist (PCS)

Submit name, address, telephone number, fax number, and e-mail address of the INDEPENDENT THIRD-PARTY PCS. Submit documentation that the PCS is certified by the Association for Materials Protection and Performance (AMPP) (formerly SSPC: The Society for Protective Coatings (SSPC)),

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

1.4.6.3 Qualifications of Coatings Inspection Company

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

1.4.6.4 Qualifications of Quality Assurance Coatings Inspector

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

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

1.4.6.5 Qualifications of Coatings Contractor Company

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

NOTE: Solicitations requiring certification for pre-qualification must point out the existence and location of the certification requirement on the PROJECT INFORMATION FORM. This requirement must be pointed out in the solicitation documents for the "prior to contract award" requirement to be enforceable. Certification is a special responsibility requirement pursuant to FAR 9.104-2 Special Standards. This is analogous to requiring bidders to have a specified level of experience or expertise and GAO has sustained these types of special requirements.

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

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

- a. ISO 9001 certified;
 - b. Eight years of experience with industrial coatings;
 - c. Evidence of recent work that has Contractor Performance Assessment Report System (CPARS) ratings, or other quality/performance ratings, that are equivalent to, or exceed, "Above Average";
 - d. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating equivalency to SSPC QP 1 and SSPC QS 1 within the last two years.
 - [e. Evidence of an INDEPENDENT THIRD-PARTY audit from AMPP demonstrating equivalency to SSPC QP 2 within the last two years.
-] The coatings Contractors and coatings Subcontractors must be certified to

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

1.4.6.6 Qualifications of Individuals Performing Abrasive Blasting

Submit name, address, and telephone number of each person that will be performing abrasive blasting. Submit documentation that each blaster is qualified by AMPP to the SSPC C7 Dry Abrasive Blaster Qualification Program or the SSPC CAS Coating Application Specialist Level 2 Certification Program (Interim Status). Each blaster must remain qualified during the entire period of abrasive blasting, and the Contracting Officer must be notified of any change in qualification status within 10 days of the change. If a blaster's qualification expires, the blaster will not be allowed to perform any blasting functions until the qualification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive qualification will not be considered and liquidated damages will apply.

1.4.6.7 Qualifications of Individuals Applying Coatings

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

1.4.6.8 Qualifications of Testing Laboratory for Coatings

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

1.4.6.9 Qualifications of Testing Laboratory for Abrasive

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

1.4.6.10 Coating Materials Certificate of Conformance

Provide manufacturer's certification of conformance to[MIL-DTL-24441 for the epoxy materials and MIL-PRF-85285 and as modified in this Section for polyurethane materials][MPI 515 for epoxy materials and MPI 516 for polyurethane materials].

1.4.6.11 Joint Sealant Materials Certificate of Conformance

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

1.4.6.12 Joint Sealant Compatibility

Provide manufacturer's certification that the selected joint sealant is compatible with the coating materials.

1.4.6.13 Ferrous Metallic Abrasive Certificate of Conformance

Provide manufacturer's certification of conformance that the materials are currently in conformance with SSPC AB 3 and as modified in this Section, and have been tested within the last three years.

1.4.6.14 Non-Metallic Abrasive Certificate of Conformance

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

1.4.7 QA and QC Personnel

1.4.7.1 QC Manager

The QC Manager is as defined in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL.

1.4.7.2 Protective Coatings Specialist (PCS)

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

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

- a. Obtain, review, and understand all project documentation including, but not limited to, this Section, scope of work (SOW) project program, Coatings Work Plan, inspection and testing plan (ITP), and all submittals before the project starts, during the project, and all coatings related re-work;
- b. Attend all pre-job coatings meetings (in-person, phone, or virtually);
- c. Attend pre-final coatings walk-through (mandatory) and attend final coatings walk-through (as required).

1.4.7.3 Quality Assurance Coatings Inspector

The Quality Assurance Coatings Inspector must be considered a QC Specialist and must report to the QC Manager, as specified in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL. The Quality Assurance Coatings Inspector must be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities. The Quality Assurance Coatings Inspector must provide complete documentation of conditions and occurrences on the job site, and be aware of conditions and occurrences that are potentially detrimental to the coating system. The requirements for inspection listed in this Section are in addition to the QC inspection and reporting requirements specified in Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL. The responsibilities of the Quality Assurance Coatings Inspector are defined in QUALITY ASSURANCE COATING INSPECTOR'S FIELD RESPONSIBILITIES. These responsibilities are separate and distinct from the responsibilities of the Coatings Contractor QC Coatings Inspector.

1.4.7.4 Coatings Contractor QC Coatings Inspector

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

1.4.8 Pre-Application Meeting

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

1.5 PRODUCT DATA

1.5.1 Coating System Instructions

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

1.5.2 Joint Sealant Instructions

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

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

1.7 COATING HAZARDS

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

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions must be followed throughout mixing, application, and curing of the coatings. During 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

Make available to the Contracting Officer at least one copy of each standard to which coatings will be applied to under this Section, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 COATING SYSTEM

**NOTE: Two coating systems are able to be used in
this Section. The zinc-rich
epoxy/epoxy/polyurethane system is best suited for
coastal and marine environments due to the
protective nature of the zinc-rich epoxy. If the
structure to be coated is not in a coastal or marine
environment, the epoxy/polyurethane system may be
used. Delete the paragraphs for the coating system
that will not be used.**

Coating systems must be as specified herein; alternate systems will not be considered. Provide a complete system (primer[, intermediate coat,] and

topcoat) material from one supplier and from one manufacturer.

Each coat must be a contrasting color between the preceding and subsequent coats.

[2.1.1 Zinc-Rich Epoxy/Epoxy/Polyurethane Coating System

2.1.1.1 Zinc-Rich Epoxy Primer Coat

Epoxy polyamide, MIL-DTL-24441/19 (Formula 159, Type III).

2.1.1.2 Epoxy Intermediate Coat

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

2.1.1.3 Polyurethane Topcoat for Three-Coat System

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. Finish schedule must reflect color selected below.

Polyurethane coating topcoat of MIL-PRF-85285, Type II, [White SAE AMS-STD-595A color number 17925][Beige SAE AMS-STD-595A color number 27769 in gloss][White SAE AMS-STD-595A color number 17875, and Orange SAE AMS-STD-595A color number 12197].

Modify paragraph 3.6.4 of MIL-PRF-85285, Viscosity and Pot Life, as follows:

The viscosity of the admixed coating, when tested in accordance with ASTM D1200 through a No. 4 Ford cup, must be as follows:

Time from mix (minimum)	Maximum time through a No. 4 Ford cup
Initially	30 seconds
2 hours	60 seconds
4 hours	No gel

Modify paragraph 3.7.1 of MIL-PRF-85285, Drying Time, as follows:

When applied by spray techniques and when tested in accordance with ASTM D1640/D1640M, the coating must be set-to-touch within four hours and dry-hard within eight hours.

]2.1.2 Epoxy/Polyurethane Coating System

2.1.2.1 Epoxy Primer

Two-component, non-zinc epoxy primer qualified to MPI 515.

2.1.2.2 Polyurethane Topcoat for Two-Coat System

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. Finish schedule must reflect color selected below.

Two-component polyurethane topcoat qualified to MPI 516. Color: [White SAE AMS-STD-595A color number 17925][Beige SAE AMS-STD-595A color number 27769 in gloss][White SAE AMS-STD-595A color number 17875, and Orange SAE AMS-STD-595A color number 12197].

]2.2 JOINT SEALANT

Joint sealant must be qualified to ASTM C920, Type M, Grade NS, Class 25, Use NT. Sealant must be compatible with the coating system.

[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.

]2.4 COATING FIELD SAMPLE COLLECTION KIT

Provide a kit for each sample to be collected. Each kit must contain: a 1 liter 1 quart can for the base of the coating material; one appropriately sized can for the activator of the coating material; dipping cups for each component to be sampled; a shipping box sized for the samples to be shipped; and packing materials. Mark cans for the appropriate coating material and component (base or activator), including manufacturer's name, address, batch numbers, batch size shipped to the project site, and date of manufacture. Provide shipping documents, including either pre-paid shipping labels or a shipping number that can be used by the QC Manager to arrange pickup, addressed to the INDEPENDENT THIRD-PARTY testing laboratory.

2.5 ABRASIVE FIELD SAMPLE COLLECTION KIT

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

2.6 INSPECTION TEST KITS

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

Provide test kits that meet all of the following requirements:

- a. Contains all materials, supplies, tools, and instructions for field testing and on-site quantitative evaluation of chloride, sulfate, and nitrate ions;
- b. Extract solution is acidic, factory pre-measured, pre-packaged, and of uniform concentration;
- c. Components and solutions are mercury free and environmentally friendly;
- d. Contains new materials and solutions for each test extraction;
- e. Contains an extraction test container (vessel, sleeve, cell) that creates a sealed, encapsulated environment during salt ion extraction;
- f. Contains a test extract container 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 that meet all of the following requirements:

- a. Is a completely self-contained test kit with all materials, supplies, tools, and instructions to take tests and identify results;
- b. Uses identifiable, consistent, factory pre-measured test extract solution;
- c. Provides for testing equal volumes of abrasive and test solution;
- d. Provides for taking direct measurements of the chloride ion in parts per million (PPM), without using conversion charts or tables;
- e. Provides all new components for extraction and titration for each test;
- f. Provides a factory sealed titration device for each test;
- g. Uses the extract sampling container as the titration container.

2.6.3 Test Kit for Identifying Amine Blush on Epoxy Surfaces

Provide test kits that meet all of the following requirements:

- a. Is a completely self-contained field test kit with all materials, supplies, tools, and instructions to perform tests and indicate the presence of unreacted amines;
- b. Uses an identifiable, consistent, uniform, pre-packaged, factory pre-measured indicating solution;

- c. Contains no mercury or lead and is environmentally friendly;
- d. Contains a solution of an unreacted amine for the purpose of "self checking" the indicator solution;

2.7 ABRASIVE

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

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

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

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

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

]2.7.1 Ferrous Metallic Abrasive

2.7.1.1 New and Remanufactured Steel Grit

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

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

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

2.7.1.2 Recycled Steel Grit

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

- a. The maximum allowable chromium and cadmium content of the work mix must be 0.1 percent by weight when tested in accordance with [ASTM D3718](#) for chromium and [ASTM D3335](#) for cadmium. Modify the requirements of [SSPC AB 2](#) to add requirement for one chromate test and one cadmium test for each "LEAD" test required.
- b. The maximum allowable chloride content is 25 parts per million (PPM) as measured with the test kit described in paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES. Modify the requirements of [SSPC AB 2](#) to substitute requirement for one chloride test for each "WATER SOLUBLE CONTAMINANTS" test.

2.7.2 Non-Metallic Abrasive

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

- a. The maximum allowable chromium and cadmium content of the work mix must be less than 0.1 percent by weight when tested in accordance with [ASTM D3718](#) for chromium and [ASTM D3335](#) for cadmium.
- b. Must contain less than 7 PPM chlorides when tested with the kit provided in paragraph TEST KIT FOR MEASURING CHLORIDES IN ABRASIVES. Modify the requirements of [SSPC AB 1](#) to substitute requirement for one chloride test for each "CONDUCTIVITY TEST" required in [SSPC AB 1](#) (one random sample per 50 bags of abrasive or three random samples from each shipment, if abrasive is delivered in bulk).

2.8 WHITE ALUMINUM OXIDE NON-SKID GRIT

Size #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 pound sample:

Sieve #	Percent Retained
40	0
50	15-40
60	60-85

PART 3 EXECUTION

Perform all work, rework, and repair in accordance with approved procedures in the Coatings Work Plan. The Coatings Work Plan must be

submitted and approved by the PCS prior to mobilization, in accordance with the paragraph entitled COATINGS WORK PLAN.

[3.1 REMOVAL OF COATINGS CONTAINING HAZARDOUS MATERIALS

NOTE: Include Section 02 83 00 LEAD REMEDIATION in any project specification that requires removal or disturbance of coating containing hazardous materials. Include a contractor qualification requirement similar to the article entitled "Qualifications of Coating Contractors" in Part 1 of this Section, except that the contractor must be qualified to SSPC QP 2, Category A. Coatings containing hazardous materials can be removed and the new coating applied in a continuous operation if the contractor provides appropriate coordination of removal, cleaning, and coating application. It is specified as two separate operations to allow separate contractors to accomplish different phases of the project. With the use of SSPC QP 1 and QP 2 requirements in contracts, the same contractor will generally be accomplishing both phases of the work, and will probably want to perform both phases as a single operation 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 83 00 LEAD REMEDIATION. Coordinate surface preparation requirements from Section 02 83 00 LEAD REMEDIATION with this Section.

]3.2 FIELD SAMPLE COLLECTION AND TESTING

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

3.2.1 Coating Field Sample Collection

Coatings that are qualified to [MIL-DTL-24441 and MIL-PRF-85285][MPI 515 and MPI 516] require one sample to be collected from each coating type used on-site. This sample must be collected and set aside for the duration of the project, and must be tested if unforeseen coatings issues arise or if testing is requested by the Contracting Officer. Coatings that are not qualified to [MIL-DTL-24441 and MIL-PRF-85285][MPI 515 and MPI 516] require a random field sample from each lot of coating material used on-site in accordance with ASTM D3925. Each random sample must be tested.

For sampling, utilize sample collection kits as outlined in the paragraph COATING FIELD SAMPLE COLLECTION KIT. Each sample must consist of 1 liter 1 quart of base material, and a sample of the activator that is proportional to the mix ratio of the coating type. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly selected and shipped to the INDEPENDENT THIRD-PARTY laboratory, observing all requirements for witnessing and traceability. For purposes of quality conformance inspection, a lot is defined as that quantity of materials from a single, uniform batch produced and offered for delivery at one time. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Identify samples by designated name, specification number, batch number, project contract number, sample date, intended use, and quantity involved. If testing is required, the QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and ship one complete sample of each material in question (including base and activator) with all batch information to the INDEPENDENT THIRD-PARTY laboratory for testing as required in paragraph COATING FIELD TESTING REPORTS.

3.2.2 Abrasive Field Sample Collection

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

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

3.2.3 Coating Field Test Reports

NOTE: The bracketed options are for the zinc-rich epoxy/epoxy/polyurethane and epoxy/polyurethane coating systems respectively. Delete the bracketed option for the coating system that will not be used.

Submit test results for each sample that requires testing in paragraph COATING FIELD SAMPLE COLLECTION.[Test samples of primer, intermediate, and topcoat materials for compliance with requirements of MIL-DTL-24441 and MIL-PRF-85285.][Test samples of primer and topcoat materials for compliance with MPI 515 and MPI 516.] Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2.4 Abrasive Field Test Reports

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

3.3 SURFACES TO BE COATED

NOTE: Use the first bracketed paragraph for entirely field applied systems.

Use the second bracketed paragraph option for applied coatings systems applied entirely in the shop, where required such as, but not limited to, exterior and interior ferrous metal components identified in UFC 4-211-01 Aircraft Maintenance Hangars.

Coordinate with applicable Division 05 UFGS Sections and Division 08 UFGS Sections.

[Apply the entire coating system in the field. 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.

] [Prepare surface and apply the complete coating system in the shop. Follow all temperature, humidity, and testing requirements listed herein.

] 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 recommendations 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 the 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.

It is the Contractors responsibility to insure the feasibility and workability of the containment system. The Contractor must perform their 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. This data is does not suffice for documentation of conformity to surface conditions during application and cure of coating. Locate sensors to provide pertinent data during the surface preparation and coating application being performed, as well as the temperature extremes on the structure. Describe the location plan, including anticipated probe location changes, in the Coatings Work Plan. Monitor any heating, cooling, or dehumidification equipment used. Provide monitoring equipment to perform as follows:

- a. Data is collected in the field unit in 15-minute increments, and available for download (on-site) in a standard database format. Contractor must collect these data and make it available to the Contracting Officer, Quality Assurance Coatings Inspector, and QC Manager;
- b. Monitoring equipment must have backup power such that data collection will be uninterrupted during the entire period of the dehumidification requirement;
- c. Monitoring equipment must have capability to measure surface temperatures at a minimum of four locations anywhere on a structure, regardless of the size of the structure;
- d. Monitoring equipment must have capability to measure interior and exterior dry bulb temperature (DB), relative humidity (RH), and

dewpoint temperature (DP).

There is no requirement for connectivity of the monitoring system to control any heating, cooling, or dehumidification 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 Waterjet 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 must not be suitable for waterjetting.

Prepare steel surfaces in accordance with [SSPC PA 1](#) and as specified herein.

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, and at least every five operating hours.

3.6.2 Field Abrasive Contamination Testing

Test abrasive for salt contamination and oil contamination as required in [SSPC AB 1](#) for non-metallic abrasives, [SSPC AB 2](#) for recycled ferrous metallic abrasives, and [SSPC AB 3](#) for ferrous metallic abrasives. Modify the schedule of testing to be 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 [ASTM D4417](#), Method C. When the surface standard complies with all specified requirements, seal with a clearcoat protectant. Use

the surface standard for comparison to abrasive blasted surfaces throughout the course of work.

3.6.4 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.

Inspect all surfaces for oil or grease contamination using two or more of the following inspection techniques:

- a. VISUAL INSPECTION - Observe surface for evidence of dirt or oil.
- 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. 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.

Reject oil or grease contaminated surfaces, clean[using a water based, pH-neutral degreaser] in accordance with **SSPC SP 1**, and recheck for contamination until surfaces are free of oil and grease.

3.6.4.2 Pre-Preparation Testing for Soluble Salts Contamination

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

Test all surfaces for soluble salts 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.] Label all test tubes and retain for test verification. Reject and wash surfaces if 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 measured.

Effective washing and removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may

necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water and soluble salt remover. The soluble salt remover must be acidic, biodegradable, non-toxic, non-corrosive, and after application, will not interfere with primer adhesion. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting.[Additional testing is required when there are delays between testing and preparation or testing and coating application.] Test methods and equipment used in this phase must be included in the Coatings Work Plan.

This phase is required because pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after 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. Successful completion of pre-preparation testing and washing does not negate the requirement for pre-application testing.

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 2-4 mil surface profile is the preferred depth for preparing for zinc primer. On steel that was previously prepared to a deeper depth and coated, it is not feasible to reduce the deeper depth. A depth of 4 mils can be tolerated with an additional mil of zinc primer thickness.

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

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

Abrasive blast steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2. Prepared surfaces shall conform to SSPC VIS 1 and shall match the prepared test-panels as specified in paragraph SURFACE STANDARD. Provide a 50 to 100 micron 2 to 4 mil surface profile. Reject profile greater than 100 microns 4 mils, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with ASTM D4417, Method A and Method

C. The appearance of the surface after blasting must have the appearance of a Sand or Grit comparator. A rounded profile shape or peened surface is not acceptable. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 100 square meters 1000 square feet, plus one test area for each additional 100 square meters 1000 square feet, or part thereof. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean.

[On previously coated and prepared surfaces, determine and establish the average existing surface profile. If the pre-existing surface profile is greater than 100 microns 4 mils, or than what is allowable by the coating system instructions, the contractor must acquire written approval by the manufacturer to utilize a higher anchor profile. The manufacturer's supporting letter must state that the additional profile will not degrade coating performance in any way and will be warranted the same. Abrasive blast the steel surfaces to near-white metal in accordance with SSPC SP 10/NACE No. 2 using abrasive and technique which does not increase the existing profile. Provide a surface profile of at least 100 microns 4 mils but no additional profile than that existing. Reject profile greater than existing, discontinue abrasive blasting, and modify processes and materials to provide the specified agreed existing profile. Prepared surfaces must conform to SSPC VIS 1 and must match the prepared test-panels as specified in paragraph SURFACE STANDARD. Measure surface profile in accordance with ASTM D4417, Method A and Method C. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 100 square meters 1000 square feet, plus one test area for each additional 100 square meters 1000 square feet, or part thereof. Provide two additional measurements for each non-compliant measurement. When surfaces are re-blasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Dust and debris tend to collect at welds, plate overlaps, and surface irregularities. Do not attempt to wipe surface clean. On previously coated and prepared surfaces, profiles higher than 100 microns 4 mils should be anticipated and these procedures must be included in the Coatings Work Plan.

13.6.6 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 to be checked for beading of water misted onto surface.

3.6.7.2 Pre-Application Testing for Soluble Salts Contamination

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

be tested for high chlorides.

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

Test surfaces for soluble salt 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 where areas of coating failure to bare steel and areas of corrosion pitting were located.][Perform 30 percent of tests on bare steel at welds, divided equally between horizontal and vertical welds.] Label all test tubes and retain for test verification. One or more readings greater than 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 salts contamination. Reject contaminated surfaces, wash as required in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show acceptable results. Re-blast tested and cleaned areas as required. An atmospheric event, such as a coastal storm blowing onshore, can bring chloride contamination. Following an atmospheric event, spot testing must be accomplished to verify satisfactory conditions and to avoid intercoat contamination. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

3.6.7.3 Pre-Application Testing for Surface Cleanliness

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

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

3.7 MIXING AND APPLICATION OF COATING SYSTEM AND SEALANT

3.7.1 Preparation of Coating Materials and Sealant for Application

NOTE: The epoxy/polyurethane coating system does not have an intermediate coat. If the epoxy/polyurethane coating system is to be used,

delete the bracketed text referring to the
intermediate coat.

Each of primer, [intermediate,]topcoat, and sealant materials is a two-component material supplied in separate containers and must be mixed at proper ratios prior to application.

[3.7.1.1 Mixing Sealant, Primer, and Intermediate Coat Materials

NOTE: This paragraph is for the mixing instructions of the zinc-rich epoxy/epoxy/polyurethane coating system. If the epoxy/polyurethane coating system is to be used, delete this paragraph.

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

]3.7.1.2 Mixing Sealant and Primer Coat Materials

NOTE: This paragraph is for the mixing instructions of the epoxy/polyurethane coating system. If the zinc-rich epoxy/epoxy/polyurethane coating system is to be used, delete this paragraph.

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

]3.7.1.3 Mixing Topcoat Material

Mix in accordance with the coating system instructions, which may differ for each product. Do not mix partial kits unless standardized measuring cups are utilized. Do not alter mix ratios. All mixing processes must be witnessed by the Quality Assurance Coatings Inspector. Mix polyurethane coating materials in same temperature conditions specified in paragraph DELIVERY AND STORAGE. The polyurethane 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 thinner unless specific written recommendation from the manufacturer is obtained. No induction time is required, only thorough agitation of the mixed material.

3.7.1.4 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. Add all required solvent at time of mixing, as allowable per the coating system instructions. 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. Pre-cooling 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 shortens pot life of the Polyurethane topcoat material. The approximate pot life for epoxy coating materials is four hours. The approximate pot life for polyurethane coating materials is two hours. The approximate pot life for the sealant materials is as specified by the manufacturer.

3.7.1.5 Application Conditions and Recoat Windows

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

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

The curing process for coating materials is time, temperature, and moisture sensitive. Application condition requirements help mitigate delamination problems frequently found on industrial structures.

- a. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of the coating system and sealant as outlined in APPLICATION OF COATING SYSTEM AND JOINT SEALANT, use appropriate means of controlling air and surface temperatures, as required. Partial or total enclosures, insulation, heating or

cooling, or other appropriate measures may be required to control conditions to allow for orderly application of all required coats. Enclosure design must be included in the Coatings Work Plan.

- b. Maintain air and steel surface temperature within the range allowable by the coating system instructions 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. These conditions may require environmental controls as described in paragraph CONTAINMENT.
- c. If coating is not applied during the recoat window specified by the coating manufacturer, or if surface temperature exceeds the temperature recommended in the coating system instructions between applications, provide GLOSS REMOVAL. If the next planned coat is the topcoat, apply FILL COAT if required to fill sanding marks. Apply FILL COAT within 24 hours of GLOSS REMOVAL, then apply topcoat within RECOAT WINDOW of FILL COAT. The topcoat must be free of defects and be of uniform appearance in accordance with SSPC PA 1. Sanding marks from GLOSS REMOVAL of intermediate coat reflecting through topcoat will be considered as non-compliant. Lack of hiding by the finish coat must require additional applications to obtain uniform appearance.
- d. FILL COAT - Where indicated, apply coat of non-zinc epoxy, at 50 to 75 microns 2 to 3 mils DFT, then apply next specified full coat within recoat window of FILL COAT. A FILL COAT may be used to adjust coating thickness to comply with requirements or to fill sanding marks in non-zinc epoxy coat.
- e. GLOSS REMOVAL - Where required, hand sand in a circular fashion to remove gloss using 120-200 grit wet/dry sandpaper, followed by solvent wiping with a clean rag soaked with denatured alcohol to remove all dust. GLOSS REMOVAL of primer[and intermediate] coat[s] is to scarify surface. 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 topcoat may include removal of up to 75 microns 3 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 epoxy surfaces prior to application of subsequent coat or joint sealant for amine blush contamination using the test kit described in paragraph TEST KIT FOR IDENTIFYING AMINE BLUSH ON EPOXY SURFACES. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet, plus one test for each additional 200 square meters 2000 square feet, or part thereof. Remove any identified contamination using an approved procedure. If one or more tests show positive results for amine blush contamination, either treat all surfaces using the approved amine blush removal procedure or increase testing to ensure that all contamination is located, and then treat identified contamination using the approved procedure.

3.7.3 Application of Coating System and Joint Sealant

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

- a. Intercoat contamination - After application of primer coat and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION to ensure minimal intercoat contamination. If contamination is detected, wash per SSPC SP 1 and re-inspect. This testing may be reduced to one half of the prescribed rate for bare steel if the testing indicates no contamination when sampling is evenly distributed over surfaces being tested. If contamination is found between coats, revert to the specified testing rate. An atmospheric event, such as a coastal storm blowing onshore, can bring chloride contamination. Following an atmospheric event, spot testing must be accomplished to verify satisfactory conditions and to avoid intercoat contamination. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.
- b. Application - Apply each coat in a consistent wet film, at 90 degrees to previous coat. Ensure that primer[and intermediate] coat cold joints are no less than 150 mm 6 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[3][] meters [15][] feet from the structure perimeter[the 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 such as those described in paragraph CONTAINMENT.

NOTE: Maximum thickness measurements are to limit internal stresses in each coat and in 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. This system is limited to 12 mils to allow for maintenance overcoating without creating excessive film build.

NOTE: The first set of tables are for the zinc-rich epoxy/epoxy/polyurethane coating system. The second set of tables is for the epoxy/polyurethane coating system. Delete the set of tables that will not be used for this project.

[Apply coatings at the following specified thickness:

Coat	Minimum DFT (Microns)	Maximum DFT (Microns)
Primer	75	125
Intermediate	75	125
Top	50	75
Total system	200	325

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Primer	3	5
Intermediate	3	5
Top	2	3
Total system	8	13

] [Apply coatings at the following specified thickness:

Coat	Minimum DFT (Microns)	Maximum DFT (Microns)
Primer	150	250
Top	50	75
Total system	200	325

Coat	Minimum DFT (Mils)	Maximum DFT (Mils)
Primer	6	10
Top	2	3
Total system	8	13

] [3.7.3.1 Application of Zinc-Rich Epoxy Primer

NOTE: This paragraph is for the primer of the zinc-rich epoxy/epoxy/polyurethane coating system. If the epoxy/polyurethane coating system is to be used, delete this paragraph.

Apply primer coat, maintaining paint supply container height within 1 meter 3 feet of the paint nozzle for applying zinc primer. Maintain constant agitation of paint pot to ensure that zinc does not settle in container.

3.7.3.2 Application of STRIPE COAT for Three-Coat System

NOTE: This paragraph is for the STRIPE COAT of the

zinc-rich epoxy/epoxy/polyurethane coating system.
If the epoxy/polyurethane coating system is to be
used, delete this paragraph.

Apply a STRIPE COAT using the intermediate coating material within the recoat window of primer, allowing sufficient dry time to allow application of intermediate coat within recoat window of primer. Apply by brush, working material into corners, crevices, angles, and welds, and onto outside corners and angles. A STRIPE COAT must also be applied to areas where joint sealant will be applied. The STRIPE COAT must be applied in a contrasting color to the primer and intermediate coats and extend a width of no less than 38 mm 1.5 inches on each side of the feature being protected.

3.7.3.3 Application of Intermediate Coat

NOTE: This paragraph is for the intermediate coat
of the zinc-rich epoxy/epoxy/polyurethane coating
system. If the epoxy/polyurethane coating system is
to be used, delete this paragraph.

Apply intermediate coat within the recoat window of primer coat.

]3.7.3.4 Application of STRIPE COAT for Two-Coat System

NOTE: This paragraph is for the STRIPE COAT of the
epoxy/polyurethane coating system. If the zinc-rich
epoxy/epoxy/polyurethane coating system is to be
used, delete this paragraph.

Apply a STRIPE COAT of primer epoxy material. Apply by brush, working material into corners, crevices, angles, and welds, and onto outside corners and angles. A STRIPE COAT must also be applied to areas where joint sealant will be applied. This application must be consistent with APPLICATION OF COATING SYSTEM AND JOINT SEALANT. The STRIPE COAT must be in a contrasting color to the primer coat and extend a width of no less than 38 mm 1.5 inches on each side of the feature being protected.

3.7.3.5 Application of Epoxy Primer

Apply epoxy primer coat within recoat window of STRIPE COAT.

]3.7.3.6 Non-skid for Stairs and Top

Where non-skid is required, apply a second non-zinc epoxy 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.

3.7.3.7 Application of Topcoat

Make all required repairs to primer[and intermediate] coat[s] as specified in paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING prior to applying topcoat. Apply topcoat within recoat

window of preceding coat. The polyurethane topcoat may require multiple passes to achieve desired aesthetics and required thickness. Consult manufacturer for application procedures for anticipated temperature, humidity, and wind conditions. Do not add thinner unless a specific written recommendation from the manufacturer is obtained. Touch-up blemishes and defects within recoat window of polyurethane topcoat. Retain sample of polyurethane topcoat, from the same batch used to coat structure, to make touch-ups that might be required later.

3.7.3.8 Application of Joint Sealant

Apply joint sealant to back-to-back steel joints that are less than 10 mm 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.

3.7.3.9 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. If spot locations are less than 0.5 percent of the surface area and no greater than 150 mm 6 inches in diameter, SSPC SP 10/NACE No. 2 vacuum blasting or SSPC SP 11 using an impact tool may be allowed. Protect adjacent areas from damage and overspray. Remove dust and solvent wipe the prepared area, plus an additional 100 mm 4 inches beyond the prepared area, with clean denatured alcohol. Apply each coat within recoat window of preceding coat. Within four hours of preparation, apply zinc-rich primer to prepared steel and feather onto prepared primer. Apply intermediate coat to primed area and feather to prepared intermediate area. Apply topcoat to intermediate coat and feather to prepared topcoat. Apply each repair coat to approximate thickness of surrounding coating system.

3.7.3.10 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: _____

Primer: _____ Thickness: _____

Intermediate: _____ 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 Coatings Work Plan procedures. For marking of tank surfaces, use chalk for marking bare steel and water based markers for marking coated surfaces. 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 Field Inspection

3.9.1.1 Inspection Requirements

- a. Perform field inspection in accordance with [ASTM D3276](#) and the approved Coatings Work Plan.
- b. Provide all tools and instruments required to perform the required testing, as well as any tools or instruments that the inspector considers necessary to perform the required inspections and tests. Document each inspection and test, including required hold points and other required inspections and tests, as well as those inspections and tests deemed prudent from on-site evaluation to document a particular process or condition, as follows:
 - (1) Location or area;
 - (2) Purpose (required or special);
 - (3) Method;
 - (4) Criteria for evaluation;
 - (5) Results;
 - (6) Determination of compliance;
 - (7) List of required rework;
 - (8) Observations.
- c. Collect and record environmental conditions as described in [ASTM D3276](#) on a 24 hour basis, as follows:
 - (1) During surface preparation, every hour, or when changes occur;
 - (2) During coating application and the first four days of initial cure, every hour, or when changes occur;
 - (3) Note location, time, and temperature of the highest and lowest surface temperatures each day;
 - (4) Use a non-contact thermometer to locate temperature extremes, then verify with contact thermometers.

- d. Data collected on environmental conditions in AUTOMATED MONITORING REQUIREMENTS may be used for overnight data; however, the data must be constantly verified as to location of sensors and validity of data with respect to the coating work being accomplished.
- e. Document all equipment used in inspections and testing, including manufacturer, model number, serial number, last calibration date and future calibration date, and results of on-site calibration performed. Work documented using data from equipment found to be out of calibration must be considered as non-compliant since last calibration or calibration check, as required.
- f. Document Contractors compliance with the Coatings Work Plan.

3.9.1.2 Inspection Report Forms

Develop project-specific report forms as required to report measurements, test results, and observations being complete and conforming to 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 conformity of each inspected item. The data may be in any format, but must be legible and presented so that entered data can be quickly compared to the appropriate requirement.

3.9.1.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day, when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00.00 10 01 45 00.00 20 QUALITY CONTROL. Each report must be signed by the Quality Assurance Coatings Inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.9.1.4 Inspection Logbook

A continuous record of all activity related to this Section must be maintained in an Inspection Logbook on a daily basis. The logbook must be hard or spiral-bound book or digital program with consecutively numbered pages, and must be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.9.1.5 Inspection Equipment

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

3.9.2 Coatings Contractor QC Coatings Inspector's Field Responsibilities

The Coatings Contractor QC Coatings Inspector responsibilities include complete documentation of all daily inspection and production activities for the entire coatings project as outlined in the Coatings Work Plan, scope of work (SOW) project program, and this Section. This includes, but is not limited to, the following:

- a. Attending and documenting the pre-job meeting and acquiring the [scope of work \(SOW\) project program](#), inspection and testing plan (ITP), schedule, and a list of who will receive the QC daily inspection reports;
- b. Performing a project site walk-through with the Quality Assurance Evaluator (QAE) or asset owner, Coatings Contractor QC, QC Manager, and Quality Assurance Coatings Inspector, inspecting at least the following:
 - (1) Asset(s) to be coated;
 - (2) Equipment and placement of equipment;
 - (3) Materials delivery and storage;
 - (4) Facility operational requirements during the project.
- c. Perform all daily and hold point inspections including, but not limited to, the following:
 - (1) Check equipment, including blotter test to verify compressed air cleanliness;
 - (2) Perform non-visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR SOLUBLE SALT CONTAMINATION and PRE-APPLICATION TESTING FOR SOLUBLE SALT CONTAMINATION);
 - (3) Perform visible contaminants testing (in accordance with PRE-PREPARATION TESTING FOR OIL AND GREASE CONTAMINATION and PRE-APPLICATION TESTING FOR OIL AND GREASE CONTAMINATION);
 - (4) Obtain environmental readings;
 - (5) Perform abrasive field testing per [SSPC AB 1](#), [SSPC AB 2](#), or [SSPC AB 3](#);
 - (6) Perform surface preparation monitoring and testing;
 - (7) Perform surface cleanliness testing;
 - (8) Perform dust quantity testing;
 - (9) Record materials storage documentation (record all coating and abrasive materials information, batch numbers, segregation, and storage temperature);
 - (10) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;
 - (11) Verify, witness, and record application method;
 - (12) Perform random wet film thickness (WFT) readings;
 - (13) Perform inspection of coatings application;
 - (14) Obtain dry film thickness (DFT) readings per [SSPC PA 2](#);
 - (15) Observe label asset identification (label stickers);

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

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

- d. Writing a daily detailed summary of the work shift inspections, testing, and the day's events, including any meetings and prevalent conversations. The final daily report must include a project summary that must be part of the last daily coatings inspection report.
- e. The Coatings Contractor QC Coatings Inspector must stop all non-compliant work.

3.9.3 Quality Assurance Coatings Inspector's Field Responsibilities

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

- a. Attending and documenting the pre-job meeting and acquiring the **scope of work (SOW) project program**, ITP, schedule, and a list of who will receive the QC daily inspection reports;
- b. Performing a project site walk-through with the QAE or asset owner, prime Contractor, and coatings Contractor (QC Coatings Inspector and QC Manager), inspecting at least the following:
 - (1) Asset(s) to be coated;
 - (2) Equipment and placement of equipment;
 - (3) Materials delivery and storage;
 - (4) Facility operational requirements during the project.
- c. Verifying all daily and hold point inspections performed by the Coatings Contractor QC Coatings Inspector or QC Manager by performing mirror inspections including, but not limited to, the following:
 - (1) Verify equipment check, including blotter test to verify compressed air cleanliness;
 - (2) Verify visible contaminants testing;
 - (3) Take environmental readings;
 - (4) Perform surface preparation monitoring and testing;
 - (5) Perform surface cleanliness testing;
 - (6) Perform dust quantity test;
 - (7) Record materials storage documentation (record all coating and abrasive materials information, batch numbers, segregation, and storage temperature);
 - (8) Witness all coatings materials mixing and record mix materials temperatures, with verification of time of coatings pot life;

- (9) Verify, witness, and record application method;
- (10) Inspect coatings application;
- (11) Perform dry film thickness (DFT) readings per **SSPC PA 2**;
- (12) Inspect asset identification (label stickers);
- (13) Write Correction Action Reports (CAR), if needed;
- (14) Write Non-Conformance Reports (NCR), if needed.

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

- (1) Wet film thickness (WFT) readings by coatings applicator(s);
- (2) Non-visible contaminants testing for chlorides, sulfates, and nitrates (CSN);
- (3) Abrasive field testing per **SSPC AB 1**, **SSPC AB 2**, or **SSPC AB 3**.

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

3.10 FINAL CLEANUP

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

-- End of Section --