**UNIFIED FACILITIES GUIDE SPECIFICATIONS**

**References are in agreement with UMRL dated July 2023**
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|---|---|
| **USACE / NAVFAC / AFCEC / NASA** | **UFGS-09 97 13.27 (February 2021)** |
| | **Change 1 - 08/22** |
| | **----------** |
| **Preparing Activity: NAVFAC** | **Superseding** |
| | **UFGS-09 97 13.27 (October 2016)** |

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SECTION 09 97 13.27

HIGH PERFORMANCE COATING FOR STEEL STRUCTURES
**02/21, CHG 1: 08/22**

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**NOTE: This guide specification covers the requirements for zinc-rich epoxy/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. 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).
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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. Without knowing the existing conditions, proper (effective and financially supportable) surface preparation or coating system selection cannot be made.
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NOTE: This specification should be edited by an 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.
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NOTE: The metric standard for measuring coating thickness is microns (25.4 microns=1 mil - use nominal 25 microns=1 mil).
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NOTE: This specification is for an industry standard, 3 Coat, thin film, coating system that is compliant with EPA VOC regulations as of June 2000:

- Epoxy coats 350 g/l 2.8 lbs/gal max. VOC
- Polyurethane Topcoat 350 g/l 2.8 lbs/gal max. VOC

The designer shall review state and local, regulations and determine whether the coating in this Section complies with restrictions on volatile organic components (VOC) and other chemical constituents.
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NOTE: Previous versions of this specification have included a requirement for surfaces to be abrasive blasted to SSPC 7/NACE No.4, inspected, and repaired, prior to coating. That requirement has

been removed from this specification, and if required for a repair project, it should be included in the structural repair Section of the project specification. Tailor the paragraph to the needs of cleaning that will be required in preparation for repairs, and note that the abrasive blasting for inspection should be accomplished in such a manner that it does not conflict with any surface condition requirements in this Section, such as creating excessive surface profile that may require excessive primer thickness. For repair projects, specify appropriate portions of the steel surfacing requirements (according to NACE RPO178) from Section 33 56 21.17 SINGLE WALL ABOVE GROUND FIXED ROOF STEEL POL STORAGE TANK.
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NOTE: For purposes of this specification, the term "maintenance coating" refers to maintenance overcoating as opposed to complete removal of coatings and recoating. For maintenance coating designs, or to determine if maintenance overcoating is appropriate, a coating condition survey (CCS) should be accomplished. The CCS should be accomplished by personnel from a business that routinely performs coating evaluations, and the individual investigator should be Certified by SSPC as a Protective Coatings Specialist. The CCS should be sufficiently detailed to provide all technical information about the coatings, and structures to be coated, required to properly design the project. At a minimum, the CCS should provide a detailed report of:

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

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

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

4. Any other information of interest to the coating system management that should be identifiable by an individual trained and experienced in the field of coating analysis, coating failure analysis, and coating design.

The scope of the CCS should be tailored to the specific project, and it should be recognized that while multiple coating failures or deficiencies may look similar to the untrained eye, the risks of

**generalizing to save evaluation costs are potentially very high. The cost of large-scale failure of the overcoating, and complete replacement of the coating system, is far more than the cost of a CCS for all but the smallest projects.**

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

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

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

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

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

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

**work.**

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

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

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# PART 1 GENERAL

## 1.1 REFERENCES

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

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

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

**********

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 D3925 | (2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings |
| ASTM D4285 | (1983; R 2018) Indicating Oil or Water in Compressed Air |
| ASTM D7127 | (2017) Standard Test Method for Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces using a Portable Stylus Instrument |
| ASTM E11 | (2022) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves |

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

| | |
|---|---|
| ISO 9001 | (2015) Quality Management Systems-Requirements |

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

| | |
|---|---|
| SSPC 7/NACE No.4 | (2007) Brush-Off Blast Cleaning |
| SSPC AB 2 | (2015; E 2016) Cleanliness of Recycled Ferrous Metallic Abrasive |
| SSPC AB 3 | (2003; E 2004) Ferrous Metallic Abrasive |
| SSPC Guide 6 | (2021) Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations |
| SSPC Guide 12 | (2023) Guide for Illumination of Industrial Painting Projects |
| SSPC PA 1 | (2016) Shop, Field, and Maintenance Coating of Metals |
| SSPC PA 2 | (2015; E 2018) Procedure for Determining Conformance to Dry Coating Thickness Requirements |
| SSPC 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 5 | (2022) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies |
| SSPC QS 1 | (2015) Standard Procedure for Evaluating a Contractor's Advanced Quality Management System |
| SSPC SP 1 | (2015) Solvent Cleaning |

| | |
|---|---|
| SSPC SP 10/NACE No. 2 | (2015) Near-White Blast Cleaning |
| SSPC SP COM | (2016; E 2017) Surface Preparation Commentary for Steel and Concrete Substrates |
| SSPC VIS 1 | (2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning |

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

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

U.S. DEPARTMENT OF DEFENSE (DOD)

| | |
|---|---|
| MIL-A-22262 | (1993; Rev B; Am 1 1994; Am 2 1996; Notice 1 2021) Abrasive Blasting Media Ship Hull Blast Cleaning |
| MIL-DTL-24441 | (2009; Rev D; Notice 1 2021) Paint, Epoxy-Polyamide, General Specification for |
| MIL-DTL-24441/19 | (2009; Rev C; Notice 1 2023) 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 | (2022; Rev F) Topcoat, 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 provided throughout this Section, generally in the paragraph where used, and denoted by capital letters.

## 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.**

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

SD-05, Design Data

Containment System

SD-06 Test Reports

Joint Sealant Qualification Test Reports

Coatings Qualification Test Reports

Metallic Abrasive Qualification Test Reports

Coating Sample Test Reports

Abrasive Sample Test Reports

Inspection Report Forms

Daily Inspection Reports

Recycled Metallic Abrasive Field Test Reports (Daily and Weekly)

SD-07 Certificates

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Coating Work Plan

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications Of Individuals Performing Abrasive Blasting

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coating Inspection Company

Qualifications of QC Specialist Coating Inspector

Qualifications of Testing Laboratory for Coatings

Qualifications of Testing Laboratory for Abrasive

Qualifications of Coating Contractors

Joint Sealant Materials

Coating Materials

Coating System Component Compatibility

Non-metallic Abrasive

Metallic Abrasive

SD-08 Manufacturer's Instructions

Joint Sealant Instructions

Coating System Instructions

SD-11 Closeout Submittals

Disposal of Used Abrasive

Inspection Logbook; G[, [_____]]

## 1.4 QUALITY ASSURANCE

### 1.4.1 Contract Errors, Omissions, and Other Discrepancies

Submit all errors, omissions, and other discrepancies in contract documents the Contracting Officer within 30 days of contract award for all work covered in this Section, other than the work that will not be

uncovered until a later date. All such discrepancies shall be addressed and resolved, and the Coating Work Plan modified, prior to beginning the Initial and Follow-Up phases of work. Discrepancies that become apparent only after work is uncovered shall be identified at the earliest discoverable time and submitted for resolution. Schedule time (Float) should be built into the project schedule at those points where old work is to be uncovered or where access is not available during the first 30 days after award, to allow for resolution of contract discrepancies.

1.4.2 Corrective Action (CA)

CA shall be included in the Quality Control Plan.

1.4.2.1 Corrective Action Procedures

Develop procedures for determining the root cause of each non-compliance, developing a plan to eliminate the root cause so that the non-compliance does not recur, and following up to ensure that the root cause was eliminated. Develop Corrective Action Request (CAR) forms for initiating CA, and for tracking and documenting each step.

1.4.2.2 Implement Corrective Action

The Contractor shall take action to identify and eliminate the root cause of each non-compliance so as to prevent recurrence. These procedures shall apply to non-compliance in the work, and to non-compliance in the QC System. Corrective actions shall be appropriate to the effects of the non-compliance encountered. Each CAR shall be serialized, tracked in a Log to completion and acceptance by the Contracting Officer, and retained in project records. The Corrective Action Log, showing status of each CAR, shall be submitted to the Contracting Officer monthly. A CAR may be initiated by either the Contractor or the Contracting Officer. The Contracting Officer must approve each CAR at the root cause identification stage, the plan for elimination stage, and the close out stage after verification that the root cause has been eliminated.

1.4.3 Coating Work Plan

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**NOTE: For maintenance painting, add requirement for pre-work determination of the existing surface profile. If paint removal is specified in another Section, such as a blast cleaning prior to inspection or repair, or in the lead removal Section, include this evaluation of existing profile such that the paint removal operation does not create excessive profile.**

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This work plan shall be considered as part of the Quality Control Plan.

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

Provide procedures for verification of key processes during Initial Phase to ensure that contract requirements can be met. Key processes shall include surface preparation, coating application and curing, inspection,

and documentation, and any other process that might adversely impact orderly progression of work.

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

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

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

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

1.4.4 Design Data

1.4.4.1 Containment System

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

1.4.5 Test Reports

1.4.5.1 Joint Sealant Qualification Test Reports

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

1.4.5.2 Coatings Qualification Test Reports

Submit test results from independent laboratory of representative samples of each coating material. U.S. Department of Defense laboratories are considered to be independent laboratories for purposes of compliance with "QUALIFICATION INSPECTION" requirements herein. Samples must have been tested within the last three years. Submit results for epoxy materials as

required in paragraph QUALIFICATION INSPECTION of MIL-DTL-24441, and as revised by paragraph COATING SYSTEM herein. Submit results for polyurethane materials as required in paragraph QUALIFICATION INSPECTION of MIL-PRF-85285, and as revised by paragraph COATING SYSTEM herein. Note that requirement for QUALIFICATION INSPECTION is a pre-qualification requirement, and involves the same testing required for listing in the Qualified Products List of the respective material. See appropriate Military Specification for specific test requirements.

#### 1.4.5.3 Metallic Abrasive Qualification Test Reports

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

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

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

### 1.4.6 Qualifications

#### 1.4.6.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party CIH. Submit documentation that hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. Provide evidence of experience with hazards involved in industrial coating application work.

#### 1.4.6.2 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party PCS. Submit documentation that specialist is certified by SSPC: The Society for Protective Coatings (SSPC) as a PCS, including certification number and date of certification/recertification. If the PCS is employed by the same coating inspection company to which the coating inspector is employed, this does not violate the independent third-party requirements. The PCS shall remain certified during the entire project, and the Contracting Officer shall be notified of any change in certification status within 10 days of the change. The PCS shall not be the designated coating inspector.

#### 1.4.6.3 Qualifications of Coating Inspection Company

Submit documentation that the coating inspection company that will be performing all coating inspection functions is certified by SSPC to the requirements of SSPC QP 5 prior to contract award, and shall remain certified while accomplishing any coating inspection functions. The coating inspection company must remain so certified for the duration of the project. If a coating inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not

be considered and liquidated damages will apply. Notify the Contracting Officer of any change in coating inspection company certification status.

#### 1.4.6.4 Qualifications of QC Specialist Coating Inspector

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

#### 1.4.6.5 Qualifications Of Individuals Performing Abrasive Blasting

Submit name, address, and telephone number of each person that will be performing abrasive blasting. Submit documentation that each blaster is qualified by SSPC to the SSPC C-7 Dry Abrasive Blaster Qualification Program. Each blaster shall remain qualified during the entire period of abrasive blasting, and the Contracting Officer shall be notified of any change in qualification status.

#### 1.4.6.6 Qualifications of Testing Laboratory for Coatings

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

#### 1.4.6.7 Qualifications of Testing Laboratory for Abrasive

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

#### 1.4.6.8 Qualifications of Coating Contractors

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

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**NOTE: Solicitations requiring certification for prequalification should point out the existence and location of the certification requirement on the PROJECT INFORMATION FORM. This requirement must be pointed out in the solicitation documents for the "prior to contract award" requirement to be enforceable. Certification is a special responsibility requirement pursuant to FAR 9.104-2 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 shall be certified to either ISO 9001 or SSPC QP 1 and SSPC QS 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting Contractors and painting Subcontractors must remain so certified for the duration of the project. If a Contractor's or Subcontractor's certification expires, the firm will not be allowed to perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in Contractor certification status.

1.4.6.9 Joint Sealant Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.10 Coating Materials

Provide manufacturer's certification of conformance to contract requirements.

1.4.6.11 Coating System Component Compatibility

Provide certification from each manufacturer of components of the coating system, epoxy primer, epoxy intermediate, and polyurethane topcoat, that the supplied coating material is suitable for use in the specified coating system. Each manufacturer shall identify the specific products, including manufacturer's name, which their product may be used with. The certification shall provide the name of the manufacturer that will provide technical support for the entire system. When all coating materials are manufactured by one manufacturer, this certification is not required.

1.4.6.12 Non-metallic Abrasive

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

1.4.6.13 Metallic Abrasive

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

1.4.7 Protective Coating Specialist (PCS)

The PCS shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section 01 45 00 01 45 00.00 40 QUALITY CONTROL. The PCS shall approve all submittals prior to submission to the QC Manager for approval or submission to the government for approval.

1.4.8 Pre-Application Meeting

After approval of submittals but prior to the initiation of coating work, Contractor representatives, including at a minimum, project superintendent

and QC manager, paint foreman, coating inspector, and PCS shall have a pre-application coating preparatory meeting. This meeting shall be in addition to the pre-construction conference. Specific items addressed shall include: corrective action requirements and procedures, coating work plan, safety plan, coordination with other Sections, inspection standards, inspection requirements and tools, test procedures, environmental control system, safety plan, and test logs. Notify Contracting Officer at least ten days prior to meeting.

## 1.5 PRODUCT DATA

### 1.5.1 Joint Sealant Instructions

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

### 1.5.2 Coating System Instructions

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

## 1.6 DELIVERY AND STORAGE

Ship, store, and handle materials in accordance with SSPC PA 1, and as modified in this Section. Maintain temperature in storage spaces between 5 and 29 degrees C 40 and 85 degrees F, and air temperature more than 3 degrees C 5 degrees F above the dew-point at all times. Inspect materials for damage prior to use and return non-compliant materials to manufacturer. Remove materials with expired shelf life from government property immediately and notify the Contracting Officer.

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

## 1.7 COATING HAZARDS

**********

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

**********

Ensure that employees are trained in all aspects of the safety plan. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions shall 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 shall approve work procedures and personal protective equipment.

1.8 JOB SITE REFERENCES

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

Make available to the Contracting Officer at least one copy each of ASTM D3276, ASTM D3925, ASTM D4285, ASTM D7127, SSPC SP COM, SSPC SP 1, SSPC 7/NACE No.4, SSPC SP 10/NACE No. 2, SSPC PA 1, SSPC PA 2, SSPC Guide 6, SSPC VIS 1, SSPC QP 1, SSPC QS 1, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 JOINT SEALANT

TT-S-00230, Type II, Class B

2.2 COATING SYSTEM

**********
**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.**

**Refer to Part 3 of this Section for surface preparation.**

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

Alternate systems or products will not be considered. Provide a complete system (primer, intermediate coat, top coat) material from one supplier.

[ 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.

] The Military specification epoxy and polyurethane products specified in this Section do not require approval for listing on the QPL prior to contract award, as indicated in paragraph 3.2 of MIL-DTL-24441 and paragraph 3.1 of MIL-PRF-85285. Testing of products by an independent laboratory to the QUALIFICATION INSPECTION requirements of MIL-DTL-24441 and MIL-PRF-85285prior to contract award is required. See specific submittal requirements in paragraph QUALITY ASSURANCE.

2.2.1 Zinc-Rich Epoxy Primer Coat

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

2.2.2 Epoxy Intermediate Coat

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

2.2.3 Polyurethane Topcoat

**********

**NOTE: Check with the activity to determine the desired topcoat color and finish. Generally, use white for Navy projects and beige for Air Force projects. Color number 17925 is white, and 27769 is beige. FAA Safety colors are White 17875 and Orange 12197. Always specify contrasting colors between coats. 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, shall 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 shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).

[2.3 COLOR IDENTIFICATION OF FUEL HANDLING AND STORAGE FACILITIES

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

]2.4 COATING SAMPLE COLLECTION AND SHIPPING KIT

Provide a kit that contains one liter quart can for the base of each coating material, an appropriately sized can for each activator, dipping cups for each component to be sampled, a shipping box sized for the samples to to be shipped, and packing material. Mark cans for the appropriate component. Provide shipping documents, including either pre-paid shipping or a shipper number that can be used by the QC Manager to arrange pickup, addressed to the approved coating testing laboratory.

2.5 ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT

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

2.6 TEST KITS

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

Provide test kits 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 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

The referenced abrasive specifications have maximum limits for soluble salts contamination, however, this maximum level of contamination does not guarantee that contamination will not be transferred to the steel surface during abrasive blasting. Other factors such as on-site handling and recycling can allow contamination of abrasive. Contractors are cautioned to verify that the chosen abrasive, along with work and storage processes, allow the final surface cleanliness requirements to be achieved. Successful testing of chlorides in abrasive does not negate the final acceptance testing of steel surfaces.

**********

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

**********

[ Interpret MIL-A-22262 to include the meaning that abrasive material contains a maximum one percent by weight of any toxic substance listed in either Table Z-1, Z-2, or Z-3 or 29 CFR 1910-SUBPART Z, with the exception of inert or nuisance dust materials, arsenic, beryllium, cadmium, cobalt, lead, mercury, rhodium, silver, tellurium, thallium, and uranium. ]

**********

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

**********

### 2.7.1 Non-metallic Abrasive

Conform to MIL-A-22262, Type I (Inorganic materials)[ except that the gross gamma radioactivity shall not exceed 5 picocuries per gram]. Abrasive shall be approved by the Naval Sea Systems Command and listed on the appropriate Qualified Products List (QPL) for the specified materials. Use sampling procedures and testing frequencies as prescribed in MIL-A-22262. Use abrasive that is specifically selected and graded to provide a sharp, angular profile to the specified depth. Do not use ungraded abrasive. Make adjustments to processes or abrasive gradation to achieve specified surface profile. Recycled non-metallic abrasive shall meet all requirements of the specification each time that it is placed in the blast pot.

### 2.7.2 Metallic Abrasive

#### 2.7.2.1 New and Remanufactured Steel Grit

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

To develop a suitable work mix from new steel abrasive, a minimum of 200 - 400 recycles is required, therefore, it is advantageous for a Contractor to use remanufactured steel grit or grit reclaimed from a previous

project. Such grit shall be considered to conform if it can be traced to new grit conforming to SSPC AB 3 Class 1 and it meets all cleanliness requirements of SSPC AB 3 Class 1 when brought to the current jobsite. Submit one representative sample of this work mix to the laboratory for testing, along with samples of new material. Acceptance and use of this work mix shall not be used to justify any deviation from surface preparation requirements.

2.7.2.2 Recycled Steel Grit

Conform to the chemical and physical properties of SSPC AB 2

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 Coating 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 shall be qualified to SSPC QP-2, Category A. The removal of coatings containing hazardous materials and application of new coating system can be accomplished in a continuous operation if the contractor provides appropriate coordination of removal, cleaning, and coating application. It is specified as two separate operations to allow separate contractors to accomplish different phases of project. With the use of SSPC QP-1 and QP-2 requirements in contracts, the same contractor will generally be accomplishing both phases of work, and will probably want to perform both phases as a single operation so as not to have to prepare surface twice. To accomplish the coating removal and recoating in a continuous operation, the contractors plan must be scrutinized for appropriate controls on the removal process, and on the surface**

**preparation/coating application process. Delete this paragraph if no paint containing hazardous material is to be removed.**
**********

Coatings containing hazardous materials and identified for disturbance during surface preparation, including removal, shall 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 COATING AND ABRASIVE SAMPLE COLLECTION AND TESTING

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

3.2.1 Coating Sample Collection

Provide a sample collection kit as required in paragraph COATING SAMPLE COLLECTION AND SHIPPING KIT. From each lot, obtain a one liter quart sample of each base material, and proportional samples of each activator based on mix ratio, by random selection from sealed containers in accordance with ASTM D3925. Prior to sampling, mix contents of each sealed container to ensure uniformity. As an alternative to collecting small samples from kits, entire kits may be randomly selected and shipped to 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. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph COATING SAMPLE TEST REPORTS.

3.2.2 Abrasive Sample Collection

Provide a sample collection kit as required in paragraph ABRASIVE SAMPLE COLLECTION AND SHIPPING KIT. For purposes of quality conformance inspection, a lot shall consist of all abrasive materials of the same type from a single, uniform batch produced and offered for delivery at one time. Obtain samples of each abrasive lot using the sampling techniques and schedule of MIL-A-22262. The addition of any substance to a batch shall constitute a new lot. Identify samples by designated name, specification number, lot number, project contract number, sample date, intended use, and quantity involved. The QC manager will take possession of the packaged samples, contact the shipping company to arrange for pickup, and relinquish the samples only to the shipping representative for shipment to the approved laboratory for testing as required by the paragraph ABRASIVE SAMPLE TEST REPORTS.

3.2.3 Coating Sample Test Reports

Submit test results for each lot of coating material delivered to the jobsite. Test samples of primer, intermediate, and topcoat materials for

compliance with requirements of Table I. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.2.4 Abrasive Sample Test Reports

Submit test results for each lot of abrasive delivered to the jobsite. Test samples of metallic abrasive to the requirements of paragraph REQUIREMENTS of SSPC AB 3, except paragraph 4.1.5 DURABILITY. Test samples of non-metallic abrasive as required in paragraph QUALITY CONFORMANCE INSPECTION of MIL-A-22262. Reject entire lot represented by samples that fail one or more tests, select new lots, and test samples.

3.3 SURFACES TO BE COATED

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

3.4 LIGHTING

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

3.5 ENVIRONMENTAL CONDITIONS

3.5.1 Containment

**********

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

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

**********

Design and provide a containment system for the capture, containment, collection, storage and disposal of the waste materials generated by the work under this Section, to meet the requirements of SSPC Guide 6, Class [1][2][3]. Vapor concentrations shall 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 shall remain in any one place from beginning of abrasive blasting through initial cure of coating. Waste materials covered by this paragraph shall 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 shall perform his operations and work schedule in a manner as to minimize leakage of the

containment system. The containment system shall be properly maintained and shall not deviate from the approved drawings. If the containment system fails to function satisfactorily, the Contractor shall suspend all operations, except those required to minimize adverse impact on the environment or government property. Operations shall not resume until modifications have been made to correct the cause of the failure.

3.5.2 Automated Monitoring Requirements

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

a. Data is collected in the field unit in one minute increments, and available for download (on-site) in a standard format. Contractor shall collect this data and make available to the Contracting Officer;

b. Monitoring equipment shall have backup power such that data collection and transmission to web server will be uninterrupted during the entire period of the dehumidification requirement;

c. Monitoring equipment shall have capability to measure surface temperatures at a minimum of four locations anywhere on a 150 foot diameter by 50 foot high tank;

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

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

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

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

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

i. Internet-based controls shall provide alerts to pre-designated parties through email messaging;

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

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

The requirements listed here were developed around the Munters Exactaire Monitoring System, as this was the only monitoring system having Internet

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

## 3.6 SURFACE PREPARATION

**********

**NOTE: When editing this specification for maintenance coating work where Water jet cleaning is to be allowed, include note for the contractor to use potable water, monitor the quality of the water, and adjust water quality to assure appropriate surface preparation and final surface requirements. Refer to SSPC-SP WJ-1/NACE WJ-1 Waterjet Cleaning of Metals - Clean to Bare Substrate, SSPC-SP WJ-2/NACE WJ-2 Waterjet Cleaning of Metals - Very Thorough Cleaning, SSPC-SP WJ-3/NACE WJ-3 Waterjet Cleaning of Metals - Thorough Cleaning, and SSPC-SP WJ-4/NACE WJ-4 Waterjet Cleaning of Metals - Light Cleaning. There are many problems that might arise from both dissolved and suspended material. A common occurrence is water with high-chlorides, even in potable water, which may leave unacceptable contamination on cleaned surfaces, and may not be suitable for water jetting.**

**********

### 3.6.1 Abrasive Blasting Equipment

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

### 3.6.2 Operational Evaluation of Abrasive

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

### 3.6.3 Surface Standard

Inspect surfaces to be coated, and select plate with similar properties and surface characteristics for use as a surface standard. Blast clean one or more 300 mm one 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 D7127. 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 and/or grease contamination using two or more of the following inspection techniques: 1) Visual inspection, 2) WATER BREAK TEST, 3) CLOTH RUB TEST. Reject oil and/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.

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.

CLOTH RUB TEST - Rub a clean, white, lint free, cotton cloth onto surface and observe for discoloration. To confirm oil or grease contamination in lightly stained areas, a non-staining solvent may be used to aid in oil or grease extraction. Any visible discoloration is evidence of oil or grease contamination.

3.6.4.2 Pre-Preparation Testing for Soluble Salts Contamination

Test surfaces for soluble salts, and wash as required, prior to abrasive blasting. Soluble salt testing is also required in paragraph PRE-APPLICATION TESTING FOR SOLUBLE SALTS CONTAMINATION as a final acceptance test of prepared surfaces after abrasive blasting, and successful completion of this phase does not negate that requirement. This phase is recommended since pre-preparation testing and washing are generally more advantageous than attempting to remove soluble salt contamination after abrasive blasting. Effective removal of soluble salts will require removal of any barrier to the steel surface, including rust. This procedure may necessitate combinations of wet abrasive blasting, high pressure water rinsing, and cleaning using a solution of water washing and soluble salts remover. The soluble salts remover shall be acidic, biodegradable, nontoxic, noncorrosive, and after application, will not interfere with primer adhesion. Delays between testing and preparation, or testing and coating application, may allow for the formation of new contamination. Use potable water, or potable water modified with soluble salt remover, for all washing or wet abrasive blasting. Test methods and equipment used in this phase are selected at the Contractor's discretion.

3.6.5 Abrasive Blasting

**********

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

**The specified 2-3 mil surface profile is the preferred depth for preparing for zinc primer. On**

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

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

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

**********

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. Provide a 50 to 75 micron 2 to 3 mil surface profile. Reject profile greater than 75 microns 3 mils, discontinue abrasive blasting, and modify processes and materials to provide the specified profile. Measure surface profile in accordance with ASTM D7127, using Rmax as the measure of profile height. Record all measurements required in this standard. Measure profile at rate of three test areas for the first 100 square meters 1000 square feet plus one test area for each additional 100 square meters 1000 square feet or part thereof. When surfaces are reblasted for any reason, retest profile as specified. Following abrasive blasting, remove dust and debris by vacuum cleaning. Do not attempt to wipe surface clean.

### 3.6.6 Disposal of Used Abrasive

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

### 3.6.7 Pre-Application Testing For Surface Contamination

#### 3.6.7.1 Pre-Application Testing for Oil and Grease Contamination

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

#### 3.6.7.2 Pre-Application Testing for Soluble Salts Contamination

**********

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

**********

Test surfaces for chloride contamination using the Test Kit described in TEST KIT FOR MEASURING CHLORIDE, SULFATE AND NITRATE IONS ON STEEL AND COATED SURFACES. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet plus one test for each additional 200

square meters 2000 square feet or part thereof. [Concentrate testing of bare steel at areas of coating failure to bare steel and areas of corrosion pitting. ][Perform 30 percent of tests on bare steel at welds, divided equally between horizontal and vertical welds. ]One or more readings greater than 3 micrograms per square centimeter of chlorides or 10 micrograms per square centimeter of sulfates or 5 micrograms per square centimeter of nitrates is evidence of soluble salt contamination. Reject contaminated surfaces, wash as discussed in paragraph PRE-PREPARATION TESTING FOR SOLUBLE SALTS CONTAMINATION, allow to dry, and re-test until all required tests show allowable results. Reblast tested and cleaned areas as required. Label all test tubes and retain for test verification.

#### 3.6.7.3 Pre-Application Testing for Surface Cleanliness

Apply coatings to dust free surfaces. To test surfaces, apply strip of clear adhesive tape to surface and rub onto surface with finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminant. Reject contaminated surfaces and retest. Test surfaces at rate of three tests for the first 100 square meters 1000 square feet plus one test for each additional 100 square meters 1000 square feet or part thereof. Provide two additional tests for each failed test or questionable test. Attach test tapes to Daily Inspection Reports.

## 3.7 MIXING AND APPLICATION OF SEALANT AND COATING SYSTEM

### 3.7.1 Preparation of Sealant and Coating Materials for Application

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

#### 3.7.1.1 Mixing Sealant, Primer and Intermediate Coat Materials

Mix in accordance with manufacturer's instructions, which may differ for each product. Do not mix partial kits, or alter mix ratios. Mix materials in same temperature and humidity conditions specified in paragraph DELIVERY AND STORAGE. Allow mixed material to stand for the required induction time based on its temperature.

#### 3.7.1.2 Mixing Topcoat Material

Do not mix partial kits, or alter mix ratios. 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 solvent without specific written recommendation from the manufacturer. No induction time is required, only thorough agitation of the mixed material.

#### 3.7.1.3 Pot Life

Apply mixed products within stated pot life for each product. Stop applying when material becomes difficult to apply in a smooth, uniform wet film. Add all required solvent at time of mixing. Do not add solvent to extend pot life. Pot life is based on standard conditions at 21 degrees C 70 degrees F and 50 percent relative humidity. For every 10 degrees C 18 degrees F rise in temperature, pot life is reduced by approximately half, and for every 10 degrees C 18 degrees F drop it is approximately doubled. Usable pot life depends on the temperature of the material at the time of

mixing and the sustained temperature at the time of application. Other factors such as the shape of the container and volume of mixed material may also affect pot life. Precooling or exterior icing of components for at least 24 hours to a minimum of 10 degrees C 50 degrees F in hot climates will extend pot life. High humidity at time of mixing and application shortens pot life of the Polyurethane topcoat material. Following are approximate pot life times:

| | |
|---|---|
| Sealant | As specified by manufacturer |
| Epoxy primer and intermediate materials | 4 hours |
| Polyurethane topcoat materials | 2 hours. |

3.7.1.4 Application Conditions and Recoat Windows

**********

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

**********

**********

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

**********

The application condition requirements for the coating system are very time and temperature sensitive, and are intended to avoid the delamination problems frequently found on industrial structures. Plan coating application to ensure that specified temperature, humidity, and condensation conditions are met. If conditions do not allow for orderly application of sealant, primer, stripe coat, intermediate coat and topcoat, 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.

Maintain air and steel surface temperature between 16 and 38 degrees C 60 and 100 degrees F during application and the first four hours of cure for epoxy coats and the first eight hours of cure for polyurethane coats. Maintain steel surface temperature more than 3 degrees C 5 degrees F above the dew-point of the ambient air for the same period.

Use Table entitled "RECOAT WINDOWS" to determine appropriate recoat windows for each coat after the initial coat. Apply each coat during

appropriate RECOAT WINDOW of preceding coat. If a RECOAT WINDOW is missed, the minimum and maximum primer and intermediate coat thickness may be adjusted to accommodate a FILL COAT, however, requirements for total epoxy coating thickness and total coating thickness will not be modified. Missing more than one RECOAT WINDOW may require complete removal of coating if maximum total coating thickness requirements cannot be achieved.

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

| RECOAT WINDOWS | | | | | | |
|---|---|---|---|---|---|---|
| EPOXY OVER EPOXY | | | | | | |
| Temperature degrees C<br>Temperature degrees F | 16-21<br>60-70 | 22-27<br>71-80 | 28-32<br>12-36 | 33-38<br>91-100 | 39-43<br>101-110 | 44-49<br>111-120 |
| RECOAT WINDOW (Hrs.) | 24-72 | 18-60 | 16-48 | 12-36 | 8-18 | 4-6 |
| POLYURETHANE OVER EPOXY | | | | | | |
| Temperature degrees C<br>Temperature degrees F | 16-21<br>60-70 | 22-27<br>71-80 | 28-32<br>12-36 | 33-38<br>91-100 | 39-43<br>101-110 | 44-49<br>111-120 |
| RECOAT WINDOW (Hrs.) | 24-96 | 24-72 | 16-48 | 12-36 | 10-24 | 8-16 |
| POLYURETHANE OVER POLYURETHANE | | | | | | |
| Temperature degrees C<br>Temperature degrees F | 16-21<br>60-70 | 22-27<br>71-80 | 28-32<br>12-36 | 33-38<br>91-100 | 39-43<br>101-110 | 44-49<br>111-120 |

| RECOAT WINDOWS | | | | | | |
|---|---|---|---|---|---|---|
| RECOAT WINDOW (Hrs.) | 8-48 | 6-48 | 4-36 | 3-24 | 2-12 | 1-2 |

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

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

GLOSS REMOVAL - Where required, hand sand in a linear fashion to remove gloss using 120-200 grit wet/dry sandpaper, followed by solvent wiping with a clean rag soaked with denatured alcohol to remove all dust. GLOSS REMOVAL of primer coat is to scarify surface and shall consist of removal of approximately 25 microns 1 mil of coating. If steel is exposed during GLOSS REMOVAL, repair in accordance with paragraph PROCEDURE FOR HOLIDAY AND SPOT REPAIRS OF NEWLY APPLIED COATING. GLOSS REMOVAL of intermediate coat 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 roof joint sealant, epoxy coat, or polyurethane topcoat for amine blush contamination using the Test Kit described in paragraph TEST KIT FOR IDENTIFYING AMINE BLUSH ON EPOXY SURFACES. Test all surfaces at rate of three tests for the first 100 square meters 1000 square feet plus one test for each additional 200 square meters 2000 square feet or part thereof. Remove any identified contamination using an 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.

After application of primer coat and prior to application of each subsequent coat, perform testing prescribed in paragraph PRE-APPLICATION TESTING FOR SURFACE CONTAMINATION, as necessary, to ensure minimal intercoat contamination. This testing may be reduced to one half of the prescribed rate for bare steel if the testing indicates no contamination when sampling is evenly distributed over surfaces being tested. If contamination is found between coats, revert to the specified testing rate. Generally, oil and grease contamination and soluble salts contamination are not encountered if subsequent coats are applied within specified recoat windows and unusual atmospheric events do not occur. Such atmospheric events as a coastal storm blowing onshore can bring unusual chloride contamination. Concern for intercoat contamination

should be continually prevalent, and spot testing should be accomplished to verify satisfactory conditions. Where visual examination or spot testing indicates contamination, perform sufficient testing to verify non-contamination, or to define extent of contamination for appropriate treatment.

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 six inches from welds. Apply stripe coat by brush. For convenience, stripe coat material may be delivered by spray if followed immediately with brush-out and approved procedures include appropriate controls on thickness. Apply all other coats by spray application. Use appropriate controls to prevent airborne coating fog from drifting beyond[ [three][_____] meters [15][_____] feet from the structure perimeter] [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.

**********

**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.**

**********

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 |

3.7.3.1 Application of Primer

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

Apply a stripe coat of intermediate coat epoxy material within 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.

3.7.3.3 Application of Intermediate Coat

Apply intermediate coat within RECOAT WINDOW of primer coat.

3.7.3.4 Non-skid for Stairs and Top

Where non-skid is required, apply a second intermediate 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.

3.7.3.5 Application of Topcoat

Make all required repairs to primer and intermediate coats as specified in paragraph entitled "Procedure for Holiday and Spot Repairs of Newly Applied Coating" prior to applying topcoat. Apply topcoat within RECOAT WINDOW of intermediate coat. The polyurethane topcoat may require multiple passes to achieve desired aesthetics and required thickness. Consult manufacturer for thinning and application procedures for anticipated temperature, humidity, and wind conditions. Touch-up blemishes and defects within recoat window of polyurethane topcoat. Retain sample of polyurethane topcoat, from the same batch used to coat structure, to make touch-ups that might be required later.

3.7.3.6 Application of Joint Sealant

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

3.7.3.7 Procedure for Holiday and Spot Repairs of Newly Applied Coating

Repair coating film defects at the earliest practicable time, preferably before application of the succeeding coat. Observe all requirements for soluble salts contamination, cleanliness between coats, and application conditions. Prepare defective area in accordance with SSPC SP 10/NACE No. 2, and feather coating as required to leave 100 mm 4 inches of each succeeding coat feathered and abraded. Protect adjacent areas from damage and overspray. Remove dust and solvent wipe the prepared area plus an additional 100 mm 4 inches beyond the prepared area with clean denatured alcohol. Apply each coat within RECOAT WINDOW of preceeding coat. Within four hours of preparation, apply 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.

#### 3.7.3.8 Structure Occupancy After Coating Application

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

## 3.8 PROJECT IDENTIFICATION

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

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

## 3.9 FIELD QUALITY CONTROL

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

### 3.9.1 Coating Inspector

The coating inspector shall be considered a QC Specialist and shall report to the QC Manager, as specified in Section 01 45 00 01 45 00.00 40 QUALITY CONTROL. The Coating Inspector shall be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, during all coating repair work, and during completion activities as specified in Section 01 45 00 01 45 00.00 40 QUALITY CONTROL. The Coating Inspector shall 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 01 45 00.00 40 QUALITY CONTROL.

### 3.9.2 Field Inspection

#### 3.9.2.1 Inspection Requirements

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

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:

a. Location or area;
b. Purpose (required or special);
c. Method;
d. Criteria for evaluation;
e. Results;
f. Determination of compliance;
g. List of required rework;
h. Observations.

Collect and record Environmental Conditions as described in ASTM D3276 on a 24 hour basis, as follows:

a. During surface preparation, every two hours or when changes occur;

b. During coating application and the first four days of initial cure, every hour, or when changes occur;

c. Note location, time, and temperature of the highest and lowest surface temperatures each day;

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

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.

Document Contractors compliance with the approved Coating Work Plan.

#### 3.9.2.2 Inspection Report Forms

Develop project-specific report forms as required to report measurements, test results, and observations being complete and 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.

#### 3.9.2.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00 01 45 00.00 40 QUALITY CONTROL. Each report shall be signed by the coating inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

#### 3.9.2.4 Inspection Logbook

A continuous record of all activity related to this Section shall be

maintained in an Inspection Logbook on a daily basis. The logbook shall be hard or spiral bound with consecutively numbered pages, and shall be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. The Coating Inspector's Logbook that is sold by NACE is satisfactory. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.9.2.5 Inspection Equipment

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

## 3.10 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. Remove temporary connections to Government or Contractor furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

TABLE 1

COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS

Table Ia - Zinc-rich Epoxy Primer Coat MIL-DTL-24441/19 Formula 159

| Test | Component A | | Component B | | Mixed | |
|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Pigment content, percent (zinc dust) | --- | --- | 81.5 | 85.5 | --- | --- |
| Volatiles, percent | 42.8 | 44.3 | 8.0 | 8.4 | --- | --- |
| Non-volatile vehicle percent | 53.7 | 57.7 | 8.3 | 8.7 | --- | --- |
| Weight, Kilograms/liter | 0.87 | 1.01 | 3.30 | 3.40 | 2.80 | 2.91 |
| Weight, Pounds/gallon | 7.3 | 8.4 | 27.5 | 28.4 | 23.4 | 24.4 |
| Flashpoint, Degrees C | 35.6 | --- | 37.8 | --- | --- | --- |
| Flashpoint, Degrees F | 96 | --- | 100 | --- | --- | --- |
| Consistency, grams | --- | --- | 250 | 500 | 150 | 300 |

| TABLE 1 | | | | | | |
|---|---|---|---|---|---|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS | | | | | | |
| Table Ia - Zinc-rich Epoxy Primer Coat MIL-DTL-24441/19 Formula 159 | | | | | | |
| Test | Component A | | Component B | | Mixed | |
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Set to touch time, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | --- | 2 |
| Dry hard time, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | --- | 8 |
| Pot life, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | 4 | --- |
| Sag resistance, Micrometers | --- | --- | --- | --- | 300 | --- |
| Sag resistance, Mils | --- | --- | --- | --- | 12 | --- |
| VOC, Grams/liter | --- | --- | --- | --- | --- | 304 |
| VOC, Pounds/gallon | --- | --- | --- | --- | --- | 2.5 |
| NOTES: Test methods as specified in MIL-DTL-24441. | | | | | | |

| TABLE 1 | | | | | | |
|---|---|---|---|---|---|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS | | | | | | |
| Table Ib. - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted)) | | | | | | |
| Test | Component A | | Component B | | Mixed | |
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Pigment content, percent | 44.0 | 49.0 | 33.0 | 38.0 | --- | --- |

| TABLE 1 | | | | | | |
|---|---|---|---|---|---|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS | | | | | | |
| Table Ib. - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted)) | | | | | | |
| Test | Component A | | Component B | | Mixed | |
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Volatiles, percent | 29.0 | 35.0 | 16.0 | 21.0 | --- | --- |
| Non-volatile vehicle percent | 17.5 | 23.5 | 44.0 | 49.0 | --- | --- |
| Coarse particles, percent | --- | 0.3 | --- | 0.3 | --- | --- |
| Consistency, grams | 180 | 320 | 300 | 470 | 180 | 245 |
| Weight, Kilograms/liter | 1.39 | 1.45 | 1.29 | 1.35 | 1.34 | 1.4 |
| Weight, Pounds/gallon | 11.6 | 12.1 | 10.8 | 11.3 | 11.2 | 11.7 |
| Set to touch time, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | --- | 3 |
| Dry hard time, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | --- | 8 |
| Fineness of grind, Hegman | 4 | --- | 4 | --- | --- | --- |
| Flashpoint, Degrees C | 35.5 | --- | 37.8 | --- | --- | --- |
| Flashpoint, Degrees F | 96 | --- | 100 | --- | --- | --- |
| Titanium dioxide, percent of pigment | 91 | --- | --- | --- | --- | --- |
| Pot life, hours at 23 degrees C, 73 degrees F | --- | --- | --- | --- | 4 | --- |
| Sag resistance, Micrometers | --- | --- | --- | --- | 300 | --- |
| Sag resistance, Mils | --- | --- | --- | --- | 12 | --- |

| TABLE 1 | | | | | | |
|---|---|---|---|---|---|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS | | | | | | |
| Table Ib. - Epoxy Intermediate Coat MIL-DTL-24441/31 Formula 152 Type IV (White (Tinted)) | | | | | | |
| Test | Component A | | Component B | | Mixed | |
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Color of dry film to approximate color of SAE AMS-STD-595A color 27778 | --- | --- | --- | --- | --- | Conform |
| Contrast ratio, at 75 micrometers, 3 mils DFT | --- | --- | --- | --- | .098 | --- |
| Gloss, 60 degree specular | --- | --- | --- | --- | 35 | --- |
| VOC, Grams/liter | --- | --- | --- | --- | --- | 340 |
| VOC, Pounds/gallon | --- | --- | --- | --- | --- | 2.8 |
| GENERAL NOTES: Test methods as specified in MIL-DTL-24441.Where "Conform" is indicated, refer to specific requirements of MIL-DTL-24441/31. | | | | | | |

| TABLE I | | | | | | |
|---|---|---|---|---|---|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS | | | | | | |
| Table Ic - Polyurethane TopcoatMIL-PRF-85285 Type II (White and Colors) | | | | | | |
| Test | Component A | | Component B | | Mixed | |
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Moisture content, percent | --- | 2 | --- | --- | --- | --- |
| Course particles, percent | --- | --- | --- | --- | --- | .5 |
| Viscosity | --- | --- | --- | --- | --- | See Note 1 |
| Fineness of grind, Hegman | --- | --- | --- | --- | 7 | --- |

TABLE I

COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS

Table Ic - Polyurethane TopcoatMIL-PRF-85285 Type II (White and Colors)

| Test | Component A | | Component B | | Mixed | |
|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Drying to touch (See Note 2) | --- | --- | --- | --- | --- | 4 |
| Dry-hard (See Note 2) | --- | --- | --- | --- | --- | 8 |
| VOC, grams per liter | --- | --- | --- | --- | --- | 340 |
| Color | --- | --- | --- | --- | delta E+-1.0 | |
| Gloss 60 degree specular gloss | | | | | | |
| Gloss | --- | --- | --- | --- | --- | 90 |
| Semi-gloss | --- | --- | --- | --- | 15 | 45 |
| Opacity | --- | --- | --- | --- | 0.95 | --- |
| Flexibility | --- | --- | --- | --- | --- | Conform |
| Fluid resistance | --- | --- | --- | --- | --- | Conform |
| Heat resistance (cure) | --- | --- | --- | --- | --- | Conform |
| Solvent resistance (cure) | --- | --- | --- | --- | --- | Conform |
| Condition in container | --- | --- | --- | --- | --- | Conform |
| Odor | --- | --- | --- | --- | --- | Conform |
| Lead percent | --- | --- | --- | --- | --- | 0.06 |
| Cadmium percent | --- | --- | --- | --- | --- | 0.06 |
| Chromium percent | --- | --- | --- | --- | --- | 0.00 |

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

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

| TABLE I |
|---|
| COATING QUALITY CONFORMANCE INSPECTION REQUIREMENTS |
| Table Ic - Polyurethane TopcoatMIL-PRF-85285 Type II (White and Colors) |

| Test | Component A | | Component B | | Mixed | |
|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | Min. | Max. |
| Time from mix (minimum) | | | Maximum time through a No. 4 Ford Cup | | | |
| Initially | | | 30 seconds | | | |
| 2 hours | | | 60 seconds | | | |
| 4 hours | | | No gel | | | |

(2) Modify paragraph 3.7.1 Drying Time, of MIL-PRF-85285.
When applied by spray techniques and when tested in accordance with ASTM D1640/D1640M, the coating shall be set-to-touch within four hours and dry-hard within eight hours (see 4.6 and table I).

GENERAL NOTES:
Test methods as specified in MIL-PRF-85285, except those marked with "*".
Where "Conform" is indicated, refer to specific requirements of MIL-PRF-85285.

-- End of Section --