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UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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02/10

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References are in agreement with UMRL dated January 2021
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SECTION 33 52 80

LIQUID FUELS PIPELINE COATING SYSTEMS
02/10

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NOTE: This guide specification covers the requirements for interior and exterior coating of aboveground and buried, carbon steel, liquid fuel pipelines. The exterior coating system for aboveground pipelines is the same as used on the exterior of fuel tanks, Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES. The exterior coating system for buried pipelines is either Extruded Polyolefin system or Fusion Bonded Epoxy coating. An optional Fusion Bonded Epoxy coating is provided for the interior of pipe to protect aviation fuel from iron contamination.

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: This guide specification is intended for coating of new pipe only. For maintenance coating of existing buried pipe, a coating inspection, or coating condition survey (CCS), as described in Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES, should be accomplished prior to designing the coating project. Without a competent inspection, there is no reliable way to determine the type or condition of the existing coating

system. Without knowing the existing conditions, proper (effective and financially supportable) surface preparation or coating system selection cannot be made.

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NOTE: This specification is the result of much experience and expertise of SSPC certified Protective Coatings Specialists.

A specifier, in adapting this specification to a project, should not alter the products and processes specified herein without thorough knowledge of the need for the changes and the implications of those changes.

Prior to changing or altering the products or processes specified herein, it is recommended that the specifier consult with the NAVFAC Paints and Coatings Subject Matter Expert at Naval Facilities Engineering Service Center.

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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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PART 1 GENERAL

1.1 REFERENCES

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

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

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

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C203	(2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C209	(2019) Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections and Fitting for Steel Water Pipelines
AWWA C210	(2007) Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
AWWA C213	(2015) Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C215	(2016) Extruded Polyolefin Coatings for Steel Water Pipe
AWWA C216	(2015) Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C217	(2016; Addenda 2017) Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings

ASTM INTERNATIONAL (ASTM)

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

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 9001	(2015) Quality Management Systems-Requirements

NACE INTERNATIONAL (NACE)

NACE RP0402	(2002) Field-Applied Fusion-Bonded Epoxy (FBE) Pipe Coating Systems for Girth Weld Joints: Application, Performance, and Quality Control

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
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 3	(2010) Standard Procedure for Evaluating

	Qualifications of Shop Painting Applicators
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 10/NACE No. 2	(2007) 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

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

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1000	Air Contaminants

1.2 SYSTEM DESCRIPTION

This section specifies the requirements for[interior and] exterior coating of aboveground and buried, carbon steel, liquid fuel pipelines. The exterior coating system for aboveground pipelines is specified with the same requirements as the exterior coating system for the exterior of fuel tanks, Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES. The exterior coating system for buried pipelines is either extruded polyolefin system or fusion bonded epoxy coating.[Fusion bonded epoxy coating is specified for the interior of aviation fuel pipe to protect fuel from iron contamination.]

1.3 SUBMITTALS

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

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for

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

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

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

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

SD-03 Product Data

External Pipe Coating

[Internal Pipe Coating

] Field-Applied External Pipe Coating

SD-06 Test Reports

Qualification Testing of Shop-Applied External Pipe Coating

[Acceptance Testing of Shop-Applied Internal Pipe Coating

] Qualification Testing of Field-Applied External Pipe Coating

Inspection Report Forms

Daily Inspection Reports

SD-07 Certificates

Contract Errors, Omissions, and Other Discrepancies

Corrective Action Procedures

Coating Work Plan

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications of Pipe Coating Shop

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coating Inspection Company for Field Coating

Qualifications of Coating Inspector for Field Coating

Qualifications Of Individuals Performing Abrasive Blasting for Field Coating

Qualifications of Individuals Performing Coating Application for Field Coating

Qualifications of Individuals Performing Coating Application for Field Coating

Qualifications of Individuals Operating Plural Component Equipment (Pump Tenders) for Field Coating

Qualifications of Coating Contractors

SD-11 Closeout Submittals

Inspection Logbook

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, 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

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 non-compliant work, and demobilization. Coordinate work processes with health and safety plans and confined space entry plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

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

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 Qualifications

The qualifications specified in this paragraph must be met throughout the duration of this contract. No work that is subject to specified qualifications shall be provided by personnel or corporate entities unless all specified qualifications are met.

1.4.4.1 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.

1.4.4.2 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 not be the designated coating inspector.

1.4.4.3 Qualifications of Coating Inspection Company for Field Coating

Submit documentation that the selected coating inspection company is certified by SSPC to the requirements of SSPC QP 5 prior to contract award. The coating inspection company must remain so certified for the duration of the project.

1.4.4.4 Qualifications of Coating Inspector for Field Coating

Submit documentation that each coating inspector is employed, and qualified to SSPC QP 5, Level III, by the selected coating inspection company.

1.4.4.5 Qualifications Of Individuals Performing Abrasive Blasting for Field Coating

All individuals performing abrasive blasting shall be certified by SSPC to the SSPC C-7 Dry Abrasive Blaster Qualification Program, and shall remain certified during the entire period of coating application. Submit name, address, telephone number, and evidence of certification of each person that will be performing abrasive blasting.

This requirement applies to all manual abrasive blasting performed in shop and field locations. This requirement does not apply to automated abrasive blasting performed in the shop.

1.4.4.6 Qualifications of Individuals Performing Coating Application for Field Coating

All individuals performing coating application shall be certified by SSPC to either the SSPC C-12 Marine/Industrial Airless Spray Program or to the SSPC C-15 Plural Component Spray Program; Spray Painter Category, and shall remain certified during the entire period of coating application. Submit name, address, telephone number, and evidence of certification of each person that will be performing coating application by any method.

1.4.4.7 Qualifications of Individuals Operating Plural Component Equipment (Pump Tenders) for Field Coating

All individuals operating plural component equipment shall be certified by SSPC to the SSPC C-15 Plural Component Spray Program; Equipment Operator Category, and shall remain certified during the entire period of coating application. Submit name, address, telephone number, and evidence of certification of each person that will be operating plural component equipment.

1.4.4.8 Qualifications of Pipe Coating Shop

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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.

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Each shop that applies coatings to pipe shall be certified to either ISO 9001 or SSPC QP 3, Class A prior to contract award.

1.4.4.9 Qualifications of Coating Contractors for Field Coating

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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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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.

1.4.5 Protective Coating Specialist (PCS)

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NOTE: Specifier of this section shall ensure coordination with the related "QC Specialist" specification in Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL, as applicable. Provide the required data to complete the "QC Specialist" specifications of that Section.

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

1.4.6 Pre-Application Meeting For Field Coating

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 DELIVERY AND STORAGE

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

1.6 COATING HAZARDS

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

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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 tank cleaning, cleanup, surface preparation, and paint application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in 29 CFR 1910.1000. Comply with respiratory protection requirements in 29 CFR 1910.134. The CIH shall approve work procedures and personal protective equipment.

1.7 JOB SITE REFERENCES - SHOP

Make available to the Contracting Officer a copy of each standard to which the shop will be applying coating under this Section.

1.8 JOB SITE REFERENCES - FIELD

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

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Make available to the Contracting Officer at least one copy each of AWWA C203, AWWA C209, AWWA C210, AWWA C215, AWWA C216, AWWA C217, ISO 9001, SSPC PA 1, SSPC QP 1, SSPC QP 3, SSPC QS 1, SSPC SP COM, SSPC SP 10/NACE No. 2, and an SSPC Certified Contractor Evaluation Form at the job site.

PART 2 PRODUCTS

2.1 SHOP-APPLIED COATING FOR BURIED PIPING

2.1.1 External Pipe Coating

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NOTE: Use first option (AWWA C215 Extruded Polyolefin Coating (2-Layer Polyolefin)) for normal situations, or second option (AWWA C213 Fusion Bonded Epoxy (FBE))where fuel contaminated soil is anticipated.

AWWA C215 2-Layer Polyolefin lists minimum thickness of coating system according to pipe diameter:

Pipe diameter		Minimum coating thickness	
50 mm	up to 2 in	789 micrometers um	31 mils
75-150 mm	3-6 in	991 um	39 mils
200-400 mm	8-16 in	1143 um	45 mils
450-900 mm	18-36 in	1245 um	49 mils
950 mm	> 36 in	1753 um	69 mils

AWWA C213 FBE requires minimum and maximum thickness of 12 mils and 16 mils, respectively, for both interior and exterior coatings.

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[2-Layer Extruded Polyolefin Coating Over Soft Adhesive: AWWA C215][Fusion-Bonded Epoxy Coating: AWWA C213, minimum 375 microns 15 mils, maximum 500 microns 20 mils]

[2.1.2 Internal Pipe Coating (Lining)

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NOTE: Delete requirement for lining where not required to protect aviation fuel.

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Fusion-Bonded Epoxy Coating: AWWA C213, minimum 375 microns 15 mils, maximum 500 microns 20 mils, and certification from the coating manufacturer that the coating is suitable for immersion service in aviation fuel.

]2.2 SOURCE QUALITY CONTROL

2.2.1 Test Requirements

Qualification testing of coating materials and coating system performance requirements shall be based on laboratory testing of identical materials used in production, tested within the last two years. All required and optional tests shall be performed. Acceptance of each batch of production

coating materials may be based on laboratory testing or manufacturer's certificate of conformity.

****
NOTE: Include first bracketed text if AWWA C215 2-Layer Polyolefin coating is specified. Include second bracketed text if AWWA C213 FBE is specified, either interior or exterior, or both.
****

[Acceptance testing of Extruded Polyolefin coated pipe shall be based on all required production verification testing required by AWWA C215.][Acceptance testing of Fusion Bonded Epoxy coated pipe shall be based on all required and optional production verification testing required by AWWA C213. Perform optional production verification testing described in paragraph OPTIONAL COATING PERFORMANCE TESTING OF COATED PIPE of AWWA C213, including cross-section porosity, interface porosity, thermal analysis (DSC), permanent strain (bendability), and interfacial contamination. Perform production verification testing on a minimum of one pipe joint in the first half hour of production each day, and on a minimum of one pipe joint in the last half hour of production each day. Perform additional testing as required to segregate any non-compliant material. Testing may be performed using qualified in-house personnel and facilities, or by independent laboratory. Submit results of tests as proof of compliance.]Document compliance with the approved Coating Work Plan.

2.2.2 Coating Inspector for Shop Coating

The coating inspector shall be the shop Quality Manager or appropriate designee. The coating inspector shall be considered a QC Specialist and shall report to the prime Contractor's QC Manager, as specified in Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. The Coating Inspector shall be present during all pre-preparation testing, surface preparation, coating application, initial cure of the coating system, and during all coating repair work required of the shop. 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.

2.2.3 Shop Inspection

2.2.3.1 Inspection Requirements

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, from beginning of surface preparation through initial curing of coating, 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.

2.2.3.2 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.

2.2.3.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. Each report shall be signed by the coating inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

2.2.3.4 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.

PART 3 EXECUTION

3.1 FIELD EXTERIOR COATING OF ABOVEGROUND PIPING

Coat aboveground piping in accordance with Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES.

3.2 FIELD REPAIRS TO EXTERNAL COATING OF BURIED PIPING

3.2.1 Field-Applied External Pipe Coating

****

NOTE: This paragraph must be coordinated with Part 2 Materials. Use the first option where the shop-applied exterior coating is the AWWA C215 2-Layer Polyolefin coating, and use the second option when the exterior coating is the AWWA C213 FBE.

While other methods of repairing/girth weld coating of FBE coatings are usable according to the standard, the options allowed here are limited to those that will provide satisfactory service in fuel contaminated soil.

****

Use one or more of the following repair methods, as modified herein, to repair shop applied coatings and coat external girth welds:

[a. Coal Tar Enamel: AWWA C203, Type II enamel, Type III outerwrap

b. Coal Tar Tape: AWWA C203

c. Cold Applied Tape: AWWA C209

d. Petrolatum or Petroleum Wax Tape Coating: AWWA C217

e. Heat Shrink Sleeve: AWWA C216

][f. Fusion-Bonded Epoxy (FBE) Coating: NACE RP0402, coating material to be same as applied to pipe in shop

g. Liquid-Epoxy Coating System: AWWA C210

]3.2.2 Surface Preparation

Prepare girth welds, and repairs to bare steel, to SSPC SP 10/NACE No. 2 immediately prior to coating application. Verify that prepared surfaces comply with SSPC VIS 1 at time of coating application. All other surfaces shall be prepared in accordance with the appropriate coating standard referenced herein.

Block or suspended pipeline at a height that will allow the blast nozzle to be perpendicular to the surface being blasted, and at the proper standoff distance, at all times.

3.2.3 Soluble Salt Testing

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

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

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

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

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

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

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

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

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

3.2.3.2 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.

3.2.3.3 Pre-Application Testing for Soluble Salts Contamination

Test girth welds and areas to be repaired for chloride contamination using the Test Kit described in paragraph TEST KIT FOR MEASURING CHLORIDE, SULFATE AND NITRATE IONS ON STEEL AND COATED SURFACES. 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.

3.2.4 Coating Application

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

3.2.5 Final Inspection of Pipeline Prior to Burial

Verify that all surfaces of the pipeline are holiday-free at time of placement of backfill over pipe. Use holiday inspection requirements and acceptance criteria of the standards applicable to the coatings being tested.

3.3 PROJECT IDENTIFICATION

At the completion of the work, affix pertinent coating data on structure at a location that is readily accessible and visible from the ground. Use either stencils or nameplates. The following list generally describes the pertinent coating data, but should be modified as required to describe the coating systems.

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

3.3.1 Stencils

Use stencils on piping 8 in or larger. Use stencils with 3/4 to one inch Helvetica style letters and acrylic stencil paint of contrasting color.

3.3.2 Nameplates

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NOTE: In a salt water environment, substitute acceptable non-corroding metal such as, but not limited to, nickel-copper, 304 stainless steel, or monel. Aluminum is unacceptable. Nomenclature (or system identification) should be established by the designer. Require melamine plastic nameplates for all NAVFAC projects.
****

Use nameplates for piping smaller than 8 in. Construct plates of [anodized aluminum] [stainless steel] [melamine plastic, 3 mm 0.125 in thick, UV resistance, black with white center core, matte finish surface

and square corners] [_____]. Install nameplates in prominent locations with nonferrous screws, nonferrous bolts, or permanent adhesive. Minimum size of nameplates shall be 25 by 65 mm one by 2.5 in. Lettering shall be the normal block style with a minimum 6 mm 0.25 in height. Accurately align all lettering on nameplates. [For plastic nameplates, engrave lettering into the white core.]

3.4 FIELD QUALITY CONTROL

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

3.4.1 Coating Inspector

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

3.4.2 Field Inspection

3.4.2.1 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.

3.4.2.2 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.

3.4.2.3 Daily Inspection Reports

Submit one copy of daily inspection report completed each day when performing work under this Section, to the Contracting Officer. Note all non-compliance issues, and all issues that were reported for rework in accordance with QC procedures of Section 01 45 00.00 10 01 45 00.00 20 01 45 00.00 40 QUALITY CONTROL. Each report shall be signed by the coating inspector and the QC Manager. Submit report within 24 hours of date recorded on the report.

3.4.2.4 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.

3.4.2.5 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.

3.5 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.

-- End of Section --