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USACE / NAVFAC / AFCESA | **UFGS-09967N (September 1999)**

Preparing Activity: NAVFAC | **Replacing without revision NFGS of same number and date**

UNIFIED FACILITIES GUIDE SPECIFICATIONS
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DIVISION 09 - FINISHES

SECTION 09967N

COATING OF STEEL WATERFRONT STRUCTURES

09/99

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UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 09967N

COATING OF STEEL WATERFRONT STRUCTURES
09/99

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NOTE: This guide specification covers requirements for coating steel-sheet piling and other steel waterfront structures. Also consider using cathodic protection in addition to coating. See NAVFAC MIL-HDBK 1004/10, "Electrical Engineering Cathodic Protection."

Comments and suggestion on this specification are welcome and should be directed to the technical proponent of the specification. A listing of the technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

****

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1186	(1993) Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
ASTM E 376	(1996) Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PS 11.01	(1991) Black (or Dark Red) Coal Tar Epoxy-Polyamide Painting System
SSPC PS 13.01	(1991) Epoxy-Polyamide Painting System
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 10	(1994) Near-White Blast Cleaning
SSPC Paint 16	(1991) Coal Tar Epoxy-Polyamide Black (or Dark Red) Paint
SSPC Paint 22	(1991) Epoxy-Polyamide Paints (Primer, Intermediate, and Topcoat)

1.2 SUBMITTALS

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NOTE: Where a "G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags following any added or existing submittal items deemed sufficiently critical, complex, or aesthetically significantly to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.
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Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-07 Certificates

[Epoxy-polyamide]

[Coal tar epoxy-polyamide]

1.3 ENVIRONMENTAL CONDITIONS

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NOTE: If induction can occur in a warm area (above 21 degrees C 70 degrees F), then epoxy-polyamide can be applied at a job site having an ambient temperature as low as 4 degrees C 40 degrees F. Coal tar epoxy-polyamide should be applied when the ambient temperature is above 10 degree C 50 degrees F.
****

Start work only when ambient and curing temperatures are within limits of coating manufacturer's recommendations and at least 3 degrees C 5 degrees F above dew point temperature.

1.4 SAFETY AND HEALTH PRECAUTIONS

Materials listed in this section contain coal tar pitch volatiles, which are toxic. Follow safety procedures as recommended by manufacturer. Work in a well ventilated area. Provide, and require workers to use, impervious clothing, gloves, face shields (200 mm8 inch minimum), and other appropriate protective clothing necessary to prevent eye and skin contact with coating materials. Keep coatings away from heat, sparks and flame.

PART 2 PRODUCTS

2.1 COATING SYSTEMS

2.1.1 Coating

****

NOTE: Advantages of epoxy-polyamide are that it can be applied at lower temperatures under certain conditions and that the three-coat application lessens the possibility of pinholes. Disadvantage is that it has a longer induction time than coal tar epoxy-polyamide.

Advantages of coal tar epoxy-polyamide are that two-coats will result in 0.40 mm 16 mils thickness, it has better water resistance, and is self-priming. Disadvantages are that it gets brittle on prolonged sunlight exposure, is more hazardous to health and it comes only in black or dark red color. It is important to check local air pollution control district regulations before selecting the coating. Regulations are constantly changing, particularly regarding volatile organic compounds (VOC) limits.

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Provide catalyst component[s] for coating[s] specific for resin component[s]. Use thinners which are compatible with the coating.

****

NOTE: Choose either "Epoxy-Polyamide" or "Coal Tar Epoxy-Polyamide."

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[2.1.1.1 Epoxy-Polyamide

a. System: SSPC PS 13.01

b. Paints: SSPC Paint 22, Primer, Intermediate and Top Coats

][2.1.1.2 Coal Tar Epoxy-Polyamide

a. System: SSPC PS 11.01

b. Paints: SSPC Paint 16 [Black] [Dark Red]

]PART 3 EXECUTION

3.1 CLEANING AND PREPARATION OF SURFACES

3.1.1 Solvent Cleaning

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NOTE: SSPC SP 1, "Solvent Cleaning" covers cleaning using simple solvents, solvent wiping, immersion in solvent, solvent spray, vapor degreasing, steam cleaning with and without detergent, emulsion cleaning, chemical paint stripping, and alkaline cleaners. If local air pollution control districts restrict use of any of these systems, specify which one is to be used.
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SSPC SP 1. Remove visible oil, grease, and drawing and cutting compounds by solvent cleaning.

3.1.2 Blast Cleaning

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NOTE: Blasting alone will not remove oil or grease. Use 0.0375 mm 1 1/2 mil thickness with epoxy-polyamide system. Use 0.0625 mm 2 1/2 mil thickness with coal tar epoxy.
****

SSPC SP 10. After solvent cleaning, complete surface preparation by near-white blast cleaning. Remove residual dust from blasted surface by blowing with dry, oil-free air, vacuuming, or sweeping. Provide surface profile of at least [0.0375] [0.0625] mm [1 1/2] [2 1/2]-milthickness.

3.2 PROPORTIONING AND MIXING OF COATING SYSTEM

[3.2.1 Proportioning of Epoxy-Polyamide System

****
NOTE: Choose this paragraph or the paragraph below entitled "Proportioning of Coal Tar Epoxy-Polyamide System."
****

Epoxy-polyamide coatings consist of a two-component system that includes a pigmented polyamide resin, Component A and an epoxy resin, Component B. Mix both components in a ratio of 1 to 1 by volume. Do not thin coatings when doing so will result in total volatile organic compounds exceeding limits enacted by local air pollution control district. When thinning is allowed and is necessary, such as during cold temperature application or to improve application characteristics, add up to 0.5 liter one pint of ethylene glycol monoethyl (EGM) ether for each 4 liters gallon of the coating.

][3.2.2 Proportioning of Coal Tar Epoxy-Polyamide System

Coal tar epoxy-polyamide consists of a two-component system. Component A contains a refined coal tar pitch, polyamide resin, and a polyamine promoter to accelerate curing rate. Component B is an epoxy resin. Mix both components in a ratio of 4 parts of Component A to 1 part of Component B by volume. Do not thin coatings when doing so will result in total volatile organic compounds exceeding limits enacted by local air pollution control districts. When thinning is allowed and is necessary for proper application, use xylene or the coating manufacturer's recommended thinner, to a maximum of one liter to a 10 liter 1/2 gallon to a 5-gallon batch.

][3.2.3 Mixing of Epoxy-Polyamide System

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NOTE: Choose this paragraph or the paragraph below entitled "Mixing of Coal Tar Epoxy-Polyamide System."

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Mix components of coating by power stirring until a smooth, uniform consistency results. Stir coating periodically during its induction period. Follow Table 1 for induction time and pot life of mixed batches.

TABLE 1

JOB SITE AMBIENT TEMPERATURE AND INDUCTION TIME FOR EPOXY-POLYAMIDE SYSTEM

Ambient Temperature Degrees C	Induction Time (in hours)
4.4 to 10.0	2 at 21.1 degrees C
10.0 to 15.6	2
15.6 to 21.1	1 to 1-1/2
21.1 and above	1/2 to 1

TABLE 1

JOB SITE AMBIENT TEMPERATURE AND INDUCTION TIME FOR EPOXY-POLYAMIDE SYSTEM

Ambient Temperature Degrees F	Induction Time (in hours)
40 to 50	2 at 70 degrees F
50 to 60	2
60 to 70	1 to 1-1/2
70 and above	1/2 to 1

][3.2.4 Mixing of Coal Tar Epoxy-Polyamide System

Power stir components to a smooth, uniform consistency. Stir coating periodically during induction period. Follow coating manufacturer's requirements for induction time and pot life of mixed batches.

]3.3 COATING APPLICATION

3.3.1 General

Apply primer coating to dry surfaces not more than 4 hours after near-white blast cleaning. Apply coats of each system so that finished surfaces are free from runs, sags, brush marks and variations in color.

[3.3.1.1 Application Method for Epoxy-Polyamide System

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NOTE: Choose this paragraph or the paragraph below entitled "Application Method for Coal Tar Epoxy-Polyamide System."
****

Allow previous coat to dry to tack-free condition but not more than 72 hours before applying next coat. If more than 72 hours elapses between coats, clean surface, apply a 0.05 mm 2 mil wet film thickness of previous coat, allow to cure to a tacky film, and apply a full thickness of next coat.

][3.3.1.2 Application Method for Coal Tar Epoxy-Polyamide System

Unless otherwise specified by manufacturer's recommendations, do not allow drying time between coats to exceed 72 hours. Under conditions of direct sunlight or elevated ambient temperatures of 32 degrees C 90 degrees F or greater, limit intercoat drying period to a maximum of 24 hours.

]3.3.2 Repair of Defects

Repair detected coating holidays, thin areas, and exposed areas damaged prior to or during installation by surface treatment and application of additional coating or by manufacturer's recommendations. Allow a period of at least 72 hours to pass following final coat before placing in immersion service.

[3.3.3 Three-Coat Epoxy-Polyamide System

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NOTE: Choose this paragraph or the paragraph below entitled "Two-Coat Coal Tar Epoxy-Polyamide System."
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NOTE: Each formula of epoxy polyamide must be applied at about 0.1375 mm 5 1/2 mil wet film thickness to obtain 0.075 mm 3 mil dry film

thickness. A greater thickness is required if coating is thinned. The practical coverage rate of each coat at this thickness is about 5 square meters/liter 200 square feet/gallon. Formula 150 should be used as prime coat with other colors used for other two coats.

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Apply each coat at a dry film thickness of between 0.075 mm and 0.10 mm 3 mils and 4 mils.

][3.3.4 Two-Coat Coal Tar Epoxy-Polyamide System

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NOTE: Each unthinned coat of coal tar epoxy-polyamide must be applied at minimum of 0.275 mm 11 mils to obtain 0.20 mm 8 mils dry film thickness. A greater thickness is required if coating is thinned. The practical coverage rate for each coat is about 3 square meters/liter 120 square feet/gallon at 0.20 mm 8 mils dry film thickness.

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Apply each coat at a dry film thickness of not less than 0.20 mm 8 mils.]

3.3.5 Dry Film Thickness

Provide total system minimum dry film thickness of [0.225] [0.40] mm [9] [16] mils. Measure using a magnetic gage.

3.4 SURFACES TO BE COATED

3.4.1 Steel Waterfront Construction

[Unless otherwise stated,] coat steel work.

3.5 FIELD TESTS

[Conduct testing in presence of Contracting Officer.]

3.5.1 Holiday Testing

Prior to installation, test for holidays in total coating system. Use a low-voltage holiday detector of less than 90 volts in accordance with manufacturer's instructions. After repair of holidays by surface treatment and application of additional coating or by manufacturer's recommendation, retest with a low-voltage holiday detector.

3.5.2 Dry Film Thickness

After repair of holidays, measure dry film thickness using a magnetic dry film thickness gage in accordance with ASTM D 1186 and ASTM E 376. Re-measure after an additional coat is applied, and add it to meet minimum thickness requirements.

-- End of Section --