Specification for Corrosion Prevention Coating
Coal Tar Enamel
Table of Contents

1.0 SCOPE ..................................................................................................................................................................... 3
2.0 REFERENCE DOCUMENTS .......................................................................................................................................... 3
3.0 MATERIALS ................................................................................................................................................................ 3
4.0 EQUIPMENT AND LABOR ........................................................................................................................................... 4
5.0 SURFACE PREPARATION ............................................................................................................................................ 5
6.0 COATING APPLICATION ............................................................................................................................................. 6
7.0 INSPECTION AND TESTING ........................................................................................................................................ 8
8.0 REPAIRS ..................................................................................................................................................................... 9
9.0 STORAGE, HANDLING AND SHIPPING ...................................................................................................................... 10
10.0 PERFORMANCE OF WORK ....................................................................................................................................... 10
1.0 SCOPE

This specification shall govern the materials, application, inspection, repairs, handling of bare and coated pipe, and other requirements for external coating of pipe using coal-tar enamel and wrap. The work includes the furnishing of all labor, materials, tools and equipment and the performance of all operations and incidentals necessary for the coating, handling, storing and shipping of coated pipe. Furthermore, the work shall meet any additional requirements stated elsewhere in the CONTRACT.

As used in this specification, the following definitions shall apply:

COMPANY:

CONTRACTOR: The firm responsible by contract for the application of the coal-tar enamel to the pipe

CONTRACT: Signed work agreement between COMPANY and CONTRACTOR.

CONTRACTOR shall obtain COMPANY’s written approval for any deviations from the requirements of this specification or specifications, standards and drawings referenced herein or elsewhere in the CONTRACT. In case of conflict between documents, the order of precedence given in the CONTRACT shall govern.

This document is not intended to be all inclusive, and the use of the requirements set forth does not relieve the CONTRACTOR of his responsibility to supply a product capable of performing its intended service.

2.0 REFERENCE DOCUMENTS

The coating shall be applied in accordance with the latest editions and addenda of the following codes and standards, except as otherwise specified herein.

Steel Structures Painting Council

SSPC-SP-1 Solvent Cleaning
SSPC-SP-10 Near-White Blast Cleaning
SSPC-VIS-1 Pictorial Surface Preparation for Painting Steel Surfaces

National Association of Corrosion Engineers

RP-02-74 Recommended Practice, High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

American Water Works Association

AWWA C203-86 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

COMPANY Specifications

DSAW
Pipe Handling: Pipe Storage and Onshore/Offshore Transportation

3.0 MATERIALS

The CONTRACTOR shall supply all coating materials required by this specification.

Storage of all materials shall be in covered areas to prevent damage and deterioration to primer, enamel, reinforcing and wrapping. Only new material shall be used and stocks of materials whose shelf-life has expired shall not be used.

The coating materials shall be handled, stored and applied in accordance with the manufacturer’s specifications, or as directed by an authorized representative of the coating manufacturer. Each material container shall be marked with a durable marking material to display the date of manufacturer, manufacturer's material name, number and batch number. Each batch of material shall be certified in writing, including the results of property tests that were conducted for quality assurance before packaging.
3.1 Pipe

Unless otherwise specified, all pipe will be furnished free of mill coating.

3.2 Primer

The primer shall be a fast-drying synthetic primer that meets the following requirements:

Primer for Coal-Tar Enamel
American Water Works Association Standards
AWWA C203-86 Type B

3.3 Coal-Tar Enamel

The enamel shall be in accordance with AWWA Standard C203-86 Type I.

CONTRACTOR shall demonstrate that the coal-tar enamel he proposes to use will form a firm bond with the primer he proposes to use.

3.4 Fiberglass Wrap

The fiberglass inner wrap shall be of the reinforced type, approximately 20 mils thick that meets all fibrous-glass mat specifications given in AWWA C203-86, Appendix A, Section A2. The outer wrap shall be fiberglass fabric, coal-tar saturated to 0.1 psf minimum.

3.5 White Wash

The white wash used as a final coat shall be manufactured in accordance with the "whitewash formulas" as specified in AWWA C203-86, Section 2.11.

3.6 Kraft Paper

Kraft paper for packing the coated pipes shall meet AWWA C203-86, Section 2.13.

3.7 Abrasive

Material for abrasive cleaning shall be a steel grit and/or shot particle of a size that will produce an angular profile of not less than 1.5 mils nor more than 2.5 mils in depth. Worn abrasive shall be replaced with new material. The abrasive material and compressed air for blasting shall be free of impurities, water and oil. Adequate separators, dryers and traps shall be provided and kept empty of condensate.

3.8 Approval of Materials

CONTRACTOR shall furnish to COMPANY, at least one week before production coating begins, certified copies of test results (made by the manufacturer) covering physical and performance characteristics of each batch of primer, enamel and wrap material to be used. All certified test reports shall be properly identified with each batch of material.

4.0 EQUIPMENT AND LABOR

4.1 Condition of Equipment

All equipment and tools furnished by the coating CONTRACTOR shall be of good quality, maintained in good operating condition and suitable for use to apply materials required by this specification. All equipment shall be subject to approval by the COMPANY. Equipment shall be capable of coating joint lengths up to 42 feet long.

4.2 Rubber Wheels

All cleaning and coating machines (and pipe moving wheels or rollers) shall be equipped with rubber wheels or wheels overlaid with hard fiber to prevent marking or indenting of the pipe. Knurled steel or other type wheels, capable of marking or indenting the pipe or coating shall be prohibited.
4.3 Kettles

All kettles shall be suitable for heating the enamel and shall be equipped with the following:

a. Continuous mechanical agitation devices.
b. Recording thermometers of a suitable range (190°F to 600°F) mounted 4 inches from the bottom of the kettle. The thermometer reading shall be plainly visible and shall be operational at all times.
c. Lids which can be securely closed.
d. Wire mesh strainer boxes (1/16 inch) that can be easily cleaned.
e. Thermostatic heat controls.

The temperature recording charts from the thermometer will constitute the basis for accepting or rejecting all heated enamel. All thermometers shall be checked periodically and recalibrated by the CONTRACTOR as required or upon request of COMPANY representative.

All kettles shall be clean and may not contain any coating residues, dirt, water or other foreign matter before starting work. Kettles shall be cleaned periodically during the work at COMPANY's request. If kettles or other equipment have previously been used with a coating material that is not compatible with the material to be used in this specification, COMPANY may require CONTRACTOR to burn out the kettles and other equipment or remove all traces of the old material.

4.4 Holiday Detector

The electrical equipment used to test the coating shall be portable, low-amperage, adjustable voltage, pulse-type holiday detector employing an audible signaling device. The holiday detector shall be furnished with a coil spring electrode or a suitable brush-type electrode.

4.5 Labor

The CONTRACTOR shall provide supervision and labor for the entire coating operation from the time of receiving the pipe to loading out of transportation. The CONTRACTOR shall provide necessary facilities for COMPANY supervision and inspection of all the work.

5.0 SURFACE PREPARATION

5.1 Preparation for Blasting

Prior to blast cleaning, external surfaces shall be inspected and pre-cleaned according to SSPC-SP-1, to remove oil, grease and loosely adhering deposits. Visible oil and grease spots shall be removed by solvent wiping. Only COMPANY approved safety solvents which do not leave a residue shall be used. Prior to final grit blast, the pipe shall be preheated to a temperature from 120°F to 150°F in order to assure a dry surface and to prevent oxidation of the cleaned surface. The heat source shall not leave a residue to contaminate the pipe surface. Ends of pipe shall be protected by plugs in such a manner as to prevent entry of abrasive into the pipe interior during blasting. Any abrasive entering pipe shall be removed prior to coating.

5.2 Blasting

The pipe surface to be coated shall be cleaned to a "Near- White" finish in accordance with SSPC-SP-10. The blast pattern shall be a uniform, angular anchor profile with a minimum depth of not less than 1.5 mils to a maximum of 4.0 mils. For consistent surface finish, a stabilized working mix of the cleaning media shall be maintained by frequent small additions of a new grit commensurate with consumption; infrequent large additions shall be avoided. The cleaning media working mix shall be maintained clean of contaminants by continuous effective operation of blasting machine scalping and air wash separators.

5.3 After Blasting

After blast cleaning, the pipe surface to be coated shall be examined. All surface imperfections, such as slivers, scabs, burrs, weld splatter or gouges
shall be removed by grinding. Grinding is only allowed is so far as it will not reduce the wall thickness of the pipe beyond the minimum given by Project Specification 17001-3204/3206-2001. Pipe that cannot be repaired or that is dented shall not be coated. All ground areas shall be reblasted to the above requirements.

Pipe surface damage caused by CONTRACTOR's handling and operation shall be repaired at CONTRACTOR's expense. CONTRACTOR shall provide a minimum of two grinders for normal plant production levels to prepare the pipe surface for acceptable levels of tolerance. CONTRACTOR shall provide additional grinders when normal production levels are exceeded. If additional grinders are required, due to poor pipe surface, they will be for CONTRACTOR's account.

After blasting, the inside and outside of the pipe shall be left clean and free of abrasive materials, dust or other blasting residue. A brush off air blast or vacuum type cleaner shall be used to clean the entire pipe.

A 10 percent solution of Oakite 33 or COMPANY approved equal shall be applied to the surface while surface is 110°F to 150°F. Rate of application to be 1 gallon of solution per 100 square feet of surface area. Dwell time to be minimum of 20 seconds. Spray at 600 to 800 psig pressure fresh water to remove acid residue. Minimum of 2-1/2 gallons of water per 100 square feet of surface is required. Remove excess water by squeegee or air knife.

The cleaned pipe surfaces shall be protected from conditions of high humidity, rainfall, or surface moisture. The cleaned pipe surface shall be coated the same day it is cleaned, and shall not be allowed to flash rust before coating. Total elapsed time between grit blasting and coating of the blast cleaned surface shall be kept to a minimum to avoid the formation of oxides on the surface.

6.0 COATING APPLICATION

6.1 Application of Primer

The primer shall be cold applied to a clean, dry surface immediately after the cleaning operation. At any time when moisture collects on the steel, the steel shall be warmed to a temperature of 85°F to 125°F for a sufficient time to dry the pipe before priming.

Primer application shall be machine applied at a rate recommended by the manufacturer as a uniformly thin film which is free from pinholes, runs, drips, sags, holidays, bare spots, dust, grass or foreign matter. Primer shall completely cover the circumference of the pipe and all surfaces which are to be enamel coated except the end of the pipes and bevels. All missed spots or areas covered with insufficient primer shall be touched up immediately by hand brushing.

Primer which has been applied too heavily, such as at the base of welds, shall be brushed out before the primer sets. Hand brushing of primer where required shall be done in a neat and workmanlike manner using only good quality paint brushes.

6.2 Curing of Primer

Prior to coating, the primer shall be cured for at least the minimum time recommended by the manufacturer, but the curing time shall not exceed the manufacturer's recommended maximum time limit. If the coating is not applied within the maximum allowable time for curing, the pipe shall be recleaned and reprimed. During curing, the pipe shall be kept shielded from moisture, dirt or other foreign matter.

6.3 Preparation of Enamel

The enamel shall be furnished in expendable sheet metal or paper drums. The enamel will be chopped or cut on a suitable platform to prevent the enamel from coming into contact with dirt, weeds, cinders, grass and other contaminants.
The chopped or cut pieces of enamel shall be maintained moisture and dirt free at all times and shall be covered when they are in danger of contamination because of atmospheric conditions.

Heating of the enamel shall be in accordance with the manufacturer’s recommendations. Enamel that has been improperly heated or overheated or is found to contain coke or impurities shall be removed from the kettle and properly disposed of. The kettle shall then be cleaned and recharged with fresh enamel.

When the enamel has reached the recommended temperature, the heating unit under the kettle shall be reduced to prevent overheating. Only batch heating of the enamel will be permitted. The kettle shall be emptied of one charge of enamel and cleaned, if necessary, before the next charge of enamel is added. All enamel taken from the kettles shall be strained.

During the time the enamel is in a molten condition, it shall be continuously agitated. Kettle lids shall be kept tightly closed at all times. The temperature of the enamel required to produce the thickness of coating specified shall be maintained at all times during application.

In case of an interruption or short shutdown due to weather conditions or other unavoidable circumstances, the temperature of the enamel charge shall be reduced to approximately 100°F lower than the application temperature until coating operations resume.

6.4 Coating Dimensions

The coating and wrapping shall terminate 9 inches from each end of each length of pipe. The finished thickness of the coating and wrapping shall be a minimum of 5/32 inch throughout.

6.5 Weather

Coating shall not be applied if, in the opinion of COMPANY, weather conditions are unfavorable to the application.

6.6 Application of Enamel and Wrapping

The enamel shall be applied with an approved combination coating and wrapping machine. Enamel application shall be in such a manner that it will adhere tightly to the primed pipe in a continuous unbroken film of the specified thickness. Machine operators shall be required to make all necessary adjustments to assure a continuous film of enamel without undue loss of temperature at the point of application.

Defects, such as bubbling or foaming, shall be cause for shutting down operations until air pockets have been removed from pumps and supply lines and required coating shoe adjustments have been completed. The pipe surface temperature during application of the enamel shall be within the limits specified by the manufacturer.

Coating shoes shall be kept evenly centered on the pipe and shall not be allowed to drag or thin the enamel below the specified thickness at any point due to improper bridling. Shoes which are out of round or damaged shall be immediately replaced. Thickness of the coating applied shall be frequently tested with an approved pit gauge. The coating punctured by the pit gauge shall be repaired.

A reasonably even coating of coal-tar enamel shall be applied over the entire surface to be coated. The thickness of this layer of enamel shall be 1/8 inch plus or minus 1/32 inch.

Immediately following application of the hot tar enamel to the pipe and before the enamel has cooled appreciably, a first layer of glass fiber reinforcement material shall be applied over the enamel. The application of the glass fiber reinforcement shall be in a uniform spiral wrap and in such a manner that the wrap is drawn into the hot enamel causing enough of the enamel to penetrate through the glass to furnish a proper bond with the next layer of enamel. The glass wrap shall never be pulled through the hot coating to the metal surface.
Following application of the first glass mat, a second layer of enamel shall be applied of such thickness that the composite thickness of the two layers of enamel and reinforcement shall be a minimum of 5/32 inch. A second layer of glass fiber reinforcement shall then be applied in a tight, uniform spiral to ensure complete bonding to the coal-tar enamel. The impregnated fiber glass fabric outer wrap shall be applied immediately behind the glass fiber reinforcement in a tight uniform spiral. A COMPANY approved saturated pipeline fiber glass reinforced felt may be used as an alternative to the specified impregnated fiber glass fabric outer wrap. Application procedures and tolerances together with product description shall be submitted to COMPANY for approval.

The overlay at the edges of all wraps shall not be less than 1/2 inch, nor more than 1 inch. All of the wraps shall have a neat and smooth appearance and be free of wrinkles, buckles or other defects.

6.7 White Wash

All coated pipes other than those that will be immediately concrete coated shall be white washed to reduce solar heat damage. The final finish coat over the outer wrapper shall be a water resistant white wash and shall be applied immediately following final inspection and acceptance of the coating and wrapping.

6.8 Pipe Cleaning

All foreign substance, dirt, steel shot and other debris shall be removed from inside the pipe before stockpiling or shipping. All primer and enamel inside the pipe and on the 9 inch uncoated ends of each joint shall be removed with solvents and wiped clean taking care not to eradicate any stencilled markings. The coated pipe shall be placed in such a manner that the enamel can set, cool and harden without damage.

7.0 INSPECTION AND TESTING

7.1 COMPANY Access for Inspection

COMPANY representative(s) shall be given ready access to inspect the CONTRACTOR's quality control procedures, methods and results of the coating materials, equipment, and the CONTRACTOR's work.

All stages of the work shall be subject to full time inspection by the COMPANY. Such inspection shall not relieve the CONTRACTOR of his responsibility to provide materials and workmanship to this specification.

7.2 Inspection of COMPANY Supplied Pipe

Upon receipt of line pipe or pipe bend material supplied by COMPANY, CONTRACTOR shall perform a thorough inspection. Any damage to the material such as dents, gouges, buckles, ovalization or damage to the weld bevels shall be recorded against the pipe mill number and reported to the COMPANY. COMPANY may request CONTRACTOR to make repairs at COMPANY's expense or instruct CONTRACTOR to set aside and not coat pipe pending COMPANY's further instructions.

Any damage discovered during subsequent stages of the coating or inspection operations shall be made good by CONTRACTOR at his expense.

7.3 Joint Identification

For each joint of pipe, the following measurements, information and pipe identification shall be recorded before coating operations commence.

a. Pipe mill number
b. Joint length
c. Weight (bare pipe)
d. Any other information stencilled on the outside or inside of the pipe.
If the pipe mill number is not stencilled on the inside of the pipe it shall be paint stencilled there before coating. Pipe joint identification shall be preserved by the CONTRACTOR at all times.

7.4 Blasting Cleaning

Inspection of the blasted surface shall be by comparison to the near-white metal blast cleaning standards in SSPC-VIS-1.

7.5 Holiday Inspection

After coating operations have been completed, the CONTRACTOR shall conduct electrical inspection of all exterior coating of the pipe with an electronic holiday detector.

Any defect in the coating shall be satisfactorily repaired at the expense of the CONTRACTOR. The test voltage shall be in accordance with NACE RP-02-74. In no case, however, shall the effective voltage be less than 15,000 volts. Because of variables, such as relative humidity and temperature, the detector voltage shall be adjusted no less than twice daily: once just before starting work in the morning and once just before starting work in the afternoon. To ensure proper inspection voltage, the equipment shall be grounded in accordance with the instructions of the equipment manufacturer. All electrically detected holidays, discontinuities or coating defects rejected by the COMPANY’s representative shall be repaired and reinspected electronically to determine that coating has been repaired to meet specifications.

7.6 Field Bond Test

The CONTRACTOR shall perform field bond tests on the finished coating in accordance with Section 2.9 of AWWA C203-86 to one out of every 50 pipe lengths. The CONTRACTOR shall provide documentation on these tests and shall submit copies of the test reports to COMPANY for approval on the same day that the tests are performed.

7.7 Thickness

The CONTRACTOR shall measure the thickness of the coating on each “cut-out” required for the field bond tests. These “cut-outs” shall be repaired at CONTRACTOR’s expense. In addition, the thickness of the coating shall be measured by means of non-destructive testing using a “micro-tester” magnetic thickness gauge at random points. These non-destructive thickness measurements shall be conducted on one out of every 10 joints.

8.0 REPAIRS

8.1 Rejection

The items listed below are causes for rejection of the entire coating on individual joints of coated pipe.

a. Use of any coating materials (primer, enamel, wrapping) not meeting the requirements of this specification.

b. Coating applied to pipe for which the surface preparation is not in accordance with this specification.

c. Coating applied to pipe on which primer has been improperly applied or cured.

d. Any coated pipe that does not meet the specified coating thickness requirements.

e. Any coated pipe which does not pass the field bond tests. Failure of coating for this reason shall require additional tests on other joints of coated pipe.

f. Coated pipe joints which, in the opinion of the COMPANY, require an excessive number of holiday repairs.

g. Coated pipe joints which have excessive coating damage during handling and which, in the opinion of the COMPANY, are not suitable for repair.

8.2 Repair of Coating

The CONTRACTOR shall mark any defective part of the coating clearly, immediately after it is detected during inspection. Repairs may be made
immediately following the coating and wrapping operation or may be deferred, but in any case, shall be repaired and reinspected prior to storing or shipping.

Repairs to enamel coating shall be made by removing the wrap over the damage coating in a manner that will not disbond the adjacent coating. The repair area shall be primed and hot enamel shall then be poured or "ragged" over the area with the fiberglass fabric embedded and bonded to the enamel. All coating repairs shall be made with fiberglass wrap smoothly applied and without wrinkles or buckles.

All repairs shall be at least equal in effectiveness to the coating applied to the principal part of the line. All repairs shall be re-inspected both visually and electrically and shall be acceptable to the COMPANY.

9.0 STORAGE, HANDLING AND SHIPPING

Pipe shall be handled and stored in a manner to prevent damage to pipe walls, beveled ends, and coating. Pipe shall be handled, transported and stored in accordance with COMPANY Specification 2136600-SP-017. All pipe handling shall be with equipment approved by the COMPANY's representative. Pipe or coating damaged by the CONTRACTOR in handling or other operations shall be satisfactorily repaired at no expense to the COMPANY.

The coated pipe shall be stacked in such a manner that the exterior coating does not contact a hard surface which will cause coating damage. Stacking height shall be reduced at COMPANY representative's request if he observes detrimental effects to the pipe or coating due to stacking.

Pipe will be transported from the coating yard to the jobsite by truck, rail or barge, as specified in the CONTRACT. Pipe shall be shipped in such a manner as to adequately protect the pipe and its coating. Pipe shall be loaded for shipping in compliance with existing shipping standards and regulations.

10.0 PERFORMANCE OF WORK

CONTRACTOR shall guarantee that work performed on external coating of pipe shall be in accordance with this specification and that the application of the coating system shall be in accordance with the specifications of the coating material manufacturer. The COMPANY's representative shall have proper access rights to CONTRACTOR's plant and property to assure the COMPANY that the foregoing specifications are being followed.