SECTION 09 97 72

COATING AND LINING

PART 1 - GENERAL

1.01 SUMMARY

A. The work shall include the surface preparation and the application of the interior lining and exterior coating at the welded joint connection of the 54-inch steel tee special, as shown on Plan WD-2775-10 and as described herein. If there are conflicts between the Specifications and instructions from coating manufacturer, the more stringent document will be enforced. Interpretation and decision by City Representative will be final.

B. Contractor shall submit a letter from the coating manufacturer to confirm that the interior lining materials are in compliance with the ANSI/NSF-61 requirements.

C. All steel surfaces shall be coated and touched up as necessary. Other surfaces, such as stainless steel, aluminum, copper, and brass, shall be properly masked and protected from abrasive blasting material and coating material.

D. Dehumidifier shall be provided until the coating/lining installation is cured and complete.

E. Prior to returning the pipe in service, Contractor shall perform final holiday detection on all metal surfaces being coated and lined under this Contract. Repair any coating or lining damages due to the transportation from factory to the jobsite and the coating damages during the installation. The repairs and touch-up shall be performed only by a qualified coating applicator.

F. Acceptance of the work by the City Representative shall require that the dielectric coating and lining material meet dry film thickness requirements, holiday detection per NACE SP0188, and uniformity per applicable sections in the SSPC-PA2. For dry film thickness measurement, CITY would require coating contractor to meet the minimum DFT and maximum DFT requirements as specified in these Technical Specifications.

1.02 RELATED WORK

A. Section 26 42 40 - Corrosion Control

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of Notice Inviting Bids shall be used.

B. Steel Structures Painting Council / National Association of Corrosion Engineers

1. SSPC-SP1, Surface Preparation Specification No. 1, Solvent Cleaning

2. SSPC-SP2, Surface Preparation Specification No. 2, Hand Tool Cleaning

3. SSPC-SP3, Surface Preparation Specification No. 3, Power Tool Cleaning

4. SSPC-SP10/NACE NO.2, Surface Preparation Specification No. 10, Near-White Metal Blast Cleaning

5. SSPC-PA2, Paint Application Specification No. 2, Measurement of Dry Paint Thickness with Magnetic Gages

6. NACE SP0178-2007, Standard Practices "Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Services"

7. NACE SP0188-2006, Standard Practices "Discontinuity (Holiday) Testing of new Protective Coatings on Conductive Substrates"

8. SSPC QP1 Certification, Field Application to Complex Industrial and Marine Structures

9. SSPC QP2 Certification, Field Removal of Hazardous Coatings

C. National Sanitary Foundation

1. ANSI/NSF 61, Drinking Water System Components-Health Effects

D. American National Standards Institute / American Water Works Association

1. ANSI/AWWA C205, Cement Mortar Protective Lining and Coating for Steel Water Pipe – 4 inches and Larger

2. ANSI/AWWA C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

3. ANSI/AWWA C222, Polyurethane Coatings for the Interior and Exterior of steel water pipe fittings

4. ANSI/ASTM D4541, Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

1.04 QUALIFICATION OF THE COATING AND LINING CONTRACTOR

A. Contractor shall show experience in the application of the coating products. The experiences shall include a minimum of five projects of similar conditions, project size and scope. Contractor shall submit to the City Representative, the contact names and phone numbers of the similar projects within the last 5 years.

B. Field Coating applicator shall have an active C33 license as issued by the State of California for at least 5 years prior to the Contract.

C. Coating applicator shall be an approved applicator by the coating manufacturer, for the coating material being applied in this Contract.

D. Coating applicator shall be SSPC-QP1 and SSPC-QP2 certified.

1.05 SUBMITTALS

A. Documents showing the experiences of the coating and lining applicator. Documents shall include the sizes, and the length of the pipeline projects using the same products as specified.

B. The coating and lining material data sheet, and the available colors for the selection by the City Representative.

C. Certification letter from coating manufacturer as indicated herein Section 1.04.C.

D. Resume of the QA Coating Inspector per Section 1.06 for selection by the City Representative.

1.06 QUALITY CONTROL

A. Contractor shall provide a third-party NACE certified, QA coating inspector, as selected and directed by the CITY, to the shop and to the jobsite. The QA inspector will verify the overall Contractor's QC program of the coating/lining application, performed at the factory or at the jobsite.

B. The QA Coating Inspector shall be a NACE certified CIP (Level 3 and passed the Peer review). The QA Coating inspector shall keep the City Representative informed and shall assist the City Representative in making technical decisions.

C. The QA Coating inspector and the coating contractor shall attend the preconstruction meeting.

D. The QA Coating inspector shall be at the jobsite during the surface preparation, the coating application, routine inspections, and the final coating inspection. No coating activities shall be performed without the presence of the QA coating inspector.

E. Coating application shall not be performed until the QA Coating Inspector has approved the surface preparation.

F. The QA Coating Inspector shall monitor the ambient conditions. Surface temperature, wet bulb and dry bulb temperatures shall be monitored at all time. When the ambient conditions change beyond the parameters required for successful coating/lining operations, the QA Coating Inspector shall notify the City Representative and the coating contractor to shut down the job. Contractor shall not proceed until the ambient conditions are suitable for continuing, and as approved by the City Representative.

G. The QA Coating inspector shall inspect for the surface cleanliness, anchor profile, dry film thickness, recoat window, witness holiday detection and other inspections such as adhesion test as deemed necessary. Contractor shall repair the coating/lining where the inspection and testing were performed.

H. All coating and lining shall be inspected by the QA Coating Inspector. Contractor shall notify the City Representative at least 7 days prior to the coating and lining operations.

I. The QA Coating Inspector shall perform 100% holiday detection on the coating and lining materials being applied. The QA Coating Inspector shall submit the daily reports to City Representative for records. The record shall include, but not limited to, the information as required in Section 3.06.E of these Specifications.

J. The QA Coating Inspector shall have the right to perform additional tests as necessary which includes, but not limited to, adhesion test and the use of Tooke Gauge. If the test is a total failure, all lining and coating materials shall be removed and repaired to the

satisfactory of the QA coating inspector and the City Representative. The field applicator shall repair the coating/lining damages as a result from the QA coating inspection at no additional cost to the City.

K. The QA Coating Inspector shall be from a reputable firm who has performed daily coating inspection for water/wastewater industry for the last 5 years. Resumes of the coating inspectors shall be provided to the City Representative for selection.

L. The QA Coating Inspection Services shall be paid through a Coating Inspection Allowance as set up in the payment schedule.

1.07 EQUIPMENT REQUIREMENTS FOR COATING AND LINING OPERATIONS

A. When plural components are specified, the Contractor shall utilize Plural Component proportioning equipment capable of pumping two separate streams of coating components at the required ratio volumetrically. The use of the cartridge gun will be allowed only for patching or coating/lining repair for less than 4 sq/ft area, as approved by the City Representative.

B. Contractor shall have capability to heat the two different liquid components to a process temperature range from 100 to 110 degrees Fahrenheit.

C. Contractor shall have capability to maintain process temperature to spray through a gun or pour through the nozzle.

D. Contractor shall have capability to pump at pressures ranging from 1200 PSI to 3000 PSI.

E. Contractor shall have capability to bring the two separately proportioned streams together as one stream and mix together to provide a homogeneous mixture for reacting into a solid polymer of known properties.

F. Contractor shall provide spray atomization tip sizes matched to the pumping equipment output which provides a fully atomized spray pattern, free of "fingers" without the addition of solvents of any kind.

G. Contractor shall arrange for the approved liner material manufacturer to review and approve the equipment set up at the place that the contractor will apply the liner just prior to the startup of lining operations.

1.08 PRODUCT DELIVERY AND HANDLING

A. Deliver protective coating materials, and related items in factory-sealed, unopened containers bearing manufacturer’s name, labels, batch number, and product identification.

B. Store in unopened containers: Follow manufacturer’s recommendations for storage temperature and shelf life requirements. Products exceeded from its shelf life shall be removed from job site immediately.

C. Follow manufacturer’s recommendations for handling products containing toxic materials. Keep flammable material away from heat, sparks, and open flame. Use recommended solvents and cleaning agents for cleaning tools, equipment**,** and skin.

1.09 COORDINATION AMONG DIFFERENT TRADES

A. The general contractor shall coordinate all disciplines for smooth coating operations.

B. Welding contractor and coating applicator shall discuss with the general contractor and submit the sequence of operations to the City Representative for approval.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Compatibility: For any protective coating system, only compatible materials from a single manufacturer or the manufacturer's approved supplier shall be used, including additives**.**

B. All lining material shall be in compliance with ANSI/NSF-61 requirements. All plant applied lining material and field applied lining material shall be identical.

C. The color for each coat within a system shall be a different color. The topcoat color shall be as determined by the City Representative. Color chart for coating material shall be provided to the City Representative for color selection.

D. Manufacturer's Certification: That products furnished meet applicable Bay Area Air Quality Management District regulations as to allowable volatile organic compound (VOC) content for the place of application and use intended.

2.02 FIELD APPLIED EXTERIOR COATING MATERIAL FOR PIPE JOINTS

Underground Application

A. Coating shall be heat shrinkable sleeve for joint coating, or approved equal.

B. The heat shrinkable sleeve shall be a one-piece sleeve, suitable for the size of the pipe. The total thickness of the sleeve shall be a minimum of 100 mils after completely cured.

C. The heat shrinkable sleeve shall be Aqua-Sleeve from CANUSA, or approved equal. Filler material shall be provided for a smooth transition of different elevation of the steel surfaces and to eliminate the cathodic protection shielding affects.

2.03 FIELD APPLIED INTERIOR LINING MATERIAL FOR PIPE JOINTS

A. The lining material shall be in compliance with the requirements of ANSI/NSF 61.

B. The lining shall be polyurethane or epoxy lining. The minimum dry film thickness shall be 55 - 60 mils DFT and not exceed the NSF 61 approval for that product.

C. The polyurethane lining shall be Endura-Flex 1988, Carboline Polyclad 767, Lifelast Durahield 310, or approved equal. The epoxy lining shall be Warren Environmental S-301, Plasite 4500, Enviroline 230, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. All safety procedures established by local, state and federal agencies regarding job safety, which includes confined space requirements, shall be strictly adhered to.

B. The applicator shall follow the instructions from the printed material data sheet. No work shall be performed when the weather is not suitable for coating or lining operation. The cartridge gun, if used will be allowed only for the small patch repairs as approved by City Representative. A small patch is defined as an area smaller than 2 square feet in this Contract. Any area, larger than 2 square feet, will require approval from City Representative if cartridge gun is proposed.

C. The containment system shall be provided to prevent over spray. Dehumidification system shall be provided to hold the blast and prevent flash rust.

D. QA Coating Inspector shall perform the visual inspection, dry film thickness measurement and the holiday detection. If there is sign of coating defect, QA Coating Inspector shall notify the City Representative and perform additional testing such as adhesion test, hardness test and etc. Contractor shall touch up areas, where coating inspection were performed, to the satisfactory of the City Representative.

E. All scaffold or ladder shall not be removed until the final repairs and final inspections are completed.

F. Final touch up and holiday testing shall be done to ensure that there is no coating damage due to the transportation of the items to the jobsite, the installation, and the removal of scaffold or ladder.

G. All sharp edges, slivers, weld slag, weld spatter, and metal laminations shall be removed by grinding per NACE SP-0178.

H. Site entrance shall be limited to authorized personnel only, and then only at designated traffic areas, so as not to damage the site of the liner. Signs shall be placed conspicuously to provide warning.

I. The site shall be maintained free of foot and equipment traffic prior to and during liner installation until final acceptance, except for agreed upon testing or other such circumstances.

3.02 ABRASIVE BLASTING OPERATIONS

A. Before the abrasive blasting, all oil and grease on the surfaces of the metal shall be thoroughly removed by flushing and wiping, using coating manufacturer's approved solvent, and clean rags, and in accordance with SSPC, SP-1, Solvent Cleaning. The use of dirty or oily rags or solvent will not be permitted. All other foreign matter not removable by blasting shall be removed by other approved methods.

B. Oil and moisture separators shall be used and maintained to remove oil and moisture from the air supply lines of the blasting equipment. The blotter test shall be used for checking for oil and moisture in the air supply. This test shall be conducted daily before blasting and when air hoses or equipment is reconnected.

C. All abrasive material shall be tested for chemical contamination prior to abrasive blasting.

D. The surface preparation for the interior substrate shall be per NACE No.1/SSPC-SP5, White Metal Blast Cleaning. The anchor profile shall be as required by the lining manufacturer.

E. The surface preparation for the exterior substrate shall be per NACE No.2/SSPC-SP10, Near-White Metal Blast Cleaning, or equivalent. The anchor profile shall be as recommended per the coating manufacturer.

F. Metal surfaces to receive coating and lining shall be smooth without weld splatter, rust, or pitting. Surfaces shall be cleaned prior to application of coating and lining materials. Abrasive blast cleaned surfaces shall be coated on the same day the surface is prepared unless otherwise directed.

G. After cleaning, the surface shall be protected from and maintained free of oil, grease, dust and dirt until it has reached its final coat. Any coating defects shall be touched-up by coating and lining crew.

H. All surface areas shall be fully blasted prior to the coating and lining applications.

I. Abrasive blasting media shall be sharp, clean, dry, and graded to produce an angular anchor profile as defined in the coating manufacturer's product data sheet when measured using Testex replica tape (X-coarse).

J. Compressed air used for abrasive blasting shall be dry and free of all contaminants. Extractor/dryers of sufficient size shall be used to remove all contamination, including oil and water.

K. Dryness and cleanliness shall be verified by blowing the compressed air being used over a white blotter.

L. The degree of surface preparation specified shall be that condition at the time lining materials are applied.

M. All surfaces that have been prepared to receive lining materials shall be dry and free of all dust, spent abrasive, and other foreign matter by blowing, sweeping, vacuuming, or other suitable ways to assure a clean surface at the time of lining application.

N. Inspection: After completion of surface preparation, all surfaces to be coated shall be inspected and approved by the QA Coating Inspector prior to coating operation. Specified cleanliness shall be verified through the use of accepted practice according to SSPC or NACE standards. Visual comparators shall be utilized to verify the specified level of cleanliness.

3.03 COATING AND LINING APPLICATION

A. Application of the protective coatings shall be in accordance with the coating manufacturer’s instructions.

B. Metal surfaces to receive coating shall be smooth, without weld splatter, rust, oil or pitting. Abrasive blast cleaned surfaces shall be coated on the same day the surface is prepared.

C. The steel surface temperature shall be a minimum of 5-degree Fahrenheit above the dew point prior to the application of specified lining and coating.

D. Immediately after the QA coating inspector has approved the surface preparation, new coating shall be applied in accordance with the manufacturer application instructions.

E. Measure the soluble salts level on the surface prior to each coating application. The test kit shall be Chlor-Rid International Inc., or approved equal. Any detectable levels of Chlorides, Sulfates or Nitrates shall be less than 3-ppm by the Chlor-Rid test kit or approved equal. Adjust speed of travel, pressure of the pressure washer or dilution as necessary and retest to verify required cleanliness level is attained.

F. Irregular surfaces shall be stripe coated using the first coat of material applied. These areas shall also be touched up with intermediate coat and topcoat.

G. Method of coating application shall be as recommended by the coating manufacturer. Each application of coating and paint shall be applied evenly, free of brush marks, sags, runs and no evidence of poor workmanship.

H. Application of the first coat should follow immediately after surface preparation and cleaning. In the event that the Contractor opts to leave a blasted surface uncoated for any extended period of time, a thorough inspection shall be performed to ensure the blast cleanliness has not degraded. In the event that this occurs, reblasting shall be required.

I. Because of presence of moisture and possible contaminants in atmosphere, care shall be taken to ensure previously coated or painted surfaces are protected or recleaned prior to application of subsequent coats.

J. The Mix-Ratio and the temperature of the coating/lining material shall be frequently verified during the application.

3.04 APPLICATION OF HEAT SHRINKABLE SLEEVES

A. The manufacturer representative shall be at the job site, at the beginning of the project, to supervise and train the installation crews. Only workers, who have been trained by the representative of the heat shrinkable sleeve manufacturer, can install the heat shrinkable sleeve thereafter.

B. The steel surface shall be prepared and cleaned with hand tool or machine tool. The final surface cleanliness shall be as required by the heat shrinkable sleeve manufacturer. The installation shall be in accordance with applicable sections of AWWA-C216.

C. Select the proper torches and preheat the pipe. Maintain preheat temperature in the required range throughout installation of Shrink Sleeve.

D. Install the heat shrinkable sleeves in accordance with the instructions from the manufacturer. Trim off any damaged or curled coating resulting from preheating. At least 3-inches of shop-applied pipe coating shall be provided for overlap of the Shrink Sleeve. Heat the end of the Shrink Sleeve and attach it to the top of the pipe. Loosely fit the Shrink Sleeve over the joint, then warm and lay the closure strip on top of the previously attached end.

E. Begin heating the Shrink Sleeve at the center portion of the sleeve on the spigot side of the weld to conform it to the spigot and weld. Use a gloved hand or light roller pressure as required to gently push the sleeve into the base of the weld as the sleeve shrinks. Do not start shrinking the outer part of the sleeve until the center portion has been shrunk to conform to the weld around the entire circumference of the pipe.

F. Heat the remainder of the Shrink Sleeve outward from the center to shrink the sleeve onto the pipe. If the sleeve is wider than the holdback of the mortar coating, press the outer edges of the sleeve onto the face of the adjacent mortar. Do not create voids under the Shrink Sleeve adjacent to the mortar.

G. Never step on the field applied heat shrinkable sleeves or field applied coating until the sleeve has been cooled down or the coating has been cured.

H. Visually inspect the installed Shrink Sleeve to ensure that it is free of holes and tightly conforms to all surfaces along the contours of the pipe joint, especially at the weld and spigot.

Visual inspection on the heat shrinkable sleeves shall be as follows:

1. The edges of the sleeve are flat and not curled up away from the pipe.

2. There are no air bubbles beneath the sleeve.

3. The sleeve has been properly shrunk so there are no wrinkles.

4. There should be a mastic bead of ½" - 1" visible completely around both edges.

I. After passing visual inspection, perform holiday detection on the installed Shrink Sleeve at 10,000 volts or higher as recommended by the manufacturer.

3.05 COATING AND LINING INSPECTIONS

A. QA Coating Inspector shall witness the surface cleanliness, measure the dry film thickness of the lining and coating system and monitor the ambient conditions.

B. All coated surfaces shall be holiday free. The voltage shall be properly adjusted to detect any coating holiday. The voltage setting shall be as recommended by NACE SP0188. Coatings on valves, pipeline fittings and appurtenances shall be holiday tested prior to immersion in water and/or hydrostatic testing.

C. The Contractor shall enlist the aid of various tests and implement those tests to verify the integrity of the applied lining and coating to his satisfaction. The City Representative or his/her representative shall be permitted full access at all times to observe and be satisfied that the specification is being followed.

D. The City Representative or his/her representative shall be given sufficient notice so as to be present, when the following hold points are reached:

1. Completion of surface preparation.

2. Prior to lining and coating application.

3. During wet and dry film thickness measurements.

4. Performing the holiday detection testing.

5. During lining and coating repairs.

E. The following quality control tests shall be performed with results recorded:

1. Compressed air quality per blotter test.

2. Environmental conditions prior to lining and coating application, including substrate temperature, ambient temperature, relative humidity and dew point.

3. Observation of surface preparation, including anchor pattern, prior to application.

4. Results of ratio check of plural component proportioning equipment, where applicable. The contractor shall perform ratio test daily prior to each application. A sample will be sprayed on plastic, than dated with the time of application and batch number. All pump gages shall be in working order prior to any application of product.

5. Wet and dry film thickness measurements.

6. High-voltage discontinuity testing to assure a "pinhole-free" lining system shall be in accordance with NACE Standard RP0188, "Discontinuity (Holiday) Testing of Protective Coatings."

7. Adhesion testing shall be done in accordance with ANSI/ASTM D4541 as per Erratum to ANSI/AWWA C222-99, Standard for Polyurethane Coatings for The Interior and Exterior of Steel Water Pipe and Fittings (July 2000). Page 11, Section 5.5.5 Adhesion.

8. Coating hardness test shall be performed to verify that the coating material are within the range as published by the coating manufacturer.

F. The multi-component lining/coating material shall be verified as to proper proportioning of materials at the start of each day and at any time of equipment malfunction before resuming operations. Any necessary site clean-up due to installing improperly reacted materials shall also be made at that time.

G. The following inspection equipment shall be utilized by the contractor for performing quality control testing:

1. Sling psychrometer

2. Surface temperature thermometer

3. Ambient temperature thermometer

4. Psychrometric charts for determining relative humidity and dew point

5. High range wet and dry film thickness gages

6. Micrometer

7. Durometer, A Scale

8. Sample cans

9. Inspection glass (30 power minimum)

10. High voltage holiday detector or low voltage holiday detector as applicable.

H. The lining and coating shall be 100% inspected for free of holidays, voids, thin areas, runs, drips or sags. Any coating drip shall be properly ground off.

3.06 CURING OF PROTECTIVE COATING SYSTEM

A. The coated surfaces shall be protected from damage during curing.

B. When the coating and lining material is fully cured and prior to the return of the pipeline to service, final holiday detection shall be conducted. (See Section 1.01.F.)

3.07 LINING AND COATING REPAIR

A. Any defective or damaged areas of the lining and coating shall be removed and repaired by the Contractor. The repair shall be performed as recommended by the coating manufacturer.

B. Contractor shall touch up all mechanical joints, which include insulated/non-insulated flange joints, all bolts and nuts, and exothermic welds.

C. Any repair shall be re-inspected for dry film thickness and coating holidays before final acceptance by the City Representative.

D. Upon completion of the work, debris and containers shall be removed from the site.

E. Any damaged areas, faulty areas, or discontinuities (pinholes) found during QA inspection **WITHIN** a 24-hour (within the recoat window) period of application shall be corrected as follows:

1. Damaged or Faulty Areas (i.e., impact damage, off-ratio application, etc.): Clean area thoroughly, extending at least six inches beyond damaged area in accordance with SSPC-SP1 or with MEK, Xylene, or Naphtha (as allowed) dampened cloth (do not apply excessive solvent to repair area, the intent is to clean only), allow solvent to thoroughly dry. When thoroughly dry to touch, spray area with the liner material to the specified thickness, feathering the material into the existing liner.

2. Discontinuity (pinhole) Repair: Clean the immediate area around the detected discontinuity with MEK, Xylene, or Naphtha (as allowed) dampened cloth (do not apply excessive solvent to pinhole area, the intent is to clean only), allow solvent to thoroughly dry. Hand apply (putty Knife, etc.) a small amount of mixed material directly to the pinhole. For pinhole repairs, hand mix and thoroughly blend a small amount (normally two or three ounces at a time, for each applicator) of Part A and Part B in correct ratios and after mixing, use immediately.

F. Any damaged Areas, faulty Areas, or discontinuities (pinholes) found during QA inspection **AFTER** 24-hours of liner installation (exceeding recoat window) shall be corrected as follows:

1. Abrade the surface using abrasive blast or power tools, as practical, down to and sound material to remove surface shine, and to roughen the surface. Abraded area shall extend at least six inches (15 cm.) beyond damaged or faulty area. After abrading the surface, vacuum or blow down with clean, dry compressed air thoroughly to remove all loose particles. Clean the area thoroughly, extending at least six inches (15 cm.) beyond the damaged area with MEK, Xylene, or Naphtha (as allowed) dampened cloth (do not apply excessive solvent to pinhole area, the intent is to clean only), allow solvent to thoroughly dry. When

thoroughly dry to touch, spray area with the liner material. Discontinuity (Pinhole) repair shall be completed following the guidelines listed in Section “E” above.

3.08 WARRANTY INSPECTION

A. Warranty shall be provided for 2 years from the substantial completion date as accepted by the City Representative. The warranty inspection shall be conducted within 2 months prior to the end of the warranty period.

B. All defective work shall be repaired in strict accordance with this specification and to the satisfaction of the City Representative.

END OF SECTION