FAYETTEVILLE PUBLIC WORKS COMMISSION

PROCUREMENT DEPARTMENT

https://www.faypwc.com/bids/

Bid Addendum

PWC Number: PWC2324000

Bid Title : Phase V Annexation Project XI Area 25 Lake Rim Estates

Bid Opening Date and Time: August 29, 2023, at 2:00 pm

Addendum Number: 3

Addendum Date: August 17, 2023

Procurement Advisor: *Tanya Hazlett*
Tanya.hazlett@faypwc.com

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1. Return one properly executed copy of this addendum with bid response or prior to the Bid Opening Date/Time listed above.
2. Following are questions received about the solicitation and the SME's answers to the questions.

   Q1. Is there a manhole lining for this project?
   A1: On PP-27 MH#133 is noted to be waterproofed. On PP-9 MH#25 should be lined. Please see the attached PWC specification for lining manholes.
3. The solicitation is hereby modified as follows:

   M1. DIVISION 2- SITEWORK

   It was found that the Division 2, Sitework section did not include 02762 Manhole Lining-Polymeric. Please note this document should be referenced and has been attached to this addendum.

   M2. DIVISION 2- SITEWORK 02730 SANITARY SEWER SYSTEMS and 02505 ADJUSTMENT OF EXISTING MANHOLES

   It was found that the Division 2 SITEWORK 02730 SANITARY SEWER SYSTEMS and 02505 ADJUSTMENT OF EXISTING MANHOLES did not include information regarding the method of adjusting sanitary sewer manhole structures. Please note this additional paragraph should be referenced for adjustment of sanitary sewer manhole structures.

   PWC is specifying the use of LADTech, Inc. Injection Molded Recycled High Density Polyethylene Adjusting Rings into the project. This would be for all manholes within the project. All final grade adjustment of manhole covers and adjusting rings shall utilize the round high-density polyethylene PE) recycled adjusting rings. The contractor shall utilize flat and sloping units to match the required slope and/or grade of the structure. The annular space between the individual rings and cone basin and the rings and cover frame shall be sealed per manufacturers instruction utilized with ASTM C990 approved butyl sealant. Additionally, information may be found at HDPE Manhole Ring | Manhole Adjustment Rings (ladtech.com).

Failure to acknowledge receipt of this addendum may result in rejection of the response.

Check ONE of the following options:

☐ Bid has not been mailed. Any changes resulting from this addendum are included in our bid response.

☐ Bid has been mailed. No changes resulted from this addendum.

☐ Bid has been mailed. Changes resulting from this addendum are as follows:

Execute Addendum:

Offeror: _____

Authorized Signature: _____

Name and Titled (Typed): _____

Date: _____

DIVISION 2
SITE WORK

02762 MANHOLE LINING – POLYMERIC

GENERAL

The Contractor shall furnish all labor, materials, equipment and incidentals required and install the monolithic polymeric manhole lining system and appurtenances as specified herein. The lining system shall be used to rehabilitate the interior of all designated existing sewer manholes as indicated within these Contract Documents and as shown on the Contract Drawings. The installed lining system shall withstand all loading conditions and hydrostatic pressure.

The manhole lining system shall consist of a cementitious base coat applied to the cleaned and prepared manhole surfaces, followed by the polymeric lining system. The Contractor shall furnish all necessary materials, labor, and equipment necessary to properly prepare the surfaces and apply the polymeric lining system as specified herein. The lining system shall be compatible with the applied chimney seal. The chimney seal shall be in accordance with these Contract Documents.

The Contractor is responsible for properly preparing the existing manhole for lining prior to the installation of the lining system, including stopping all leaks, flow control, patching voids, removing steps/manhole rungs, cleaning (to include water blasting), removing rubble, root removal, debris removal, etc.

The Contractor is advised that the presence or absence of any leakage through the manhole walls as seen in the Contractor's independent inspection prior to bidding is dependent upon the ground water levels and conditions at the time of the inspections. The Contractor shall reflect his/her assumptions and judgments on leakage through the manhole walls based on this information in the unit prices bid. All leakage shall be stopped prior to installing the lining system. No additional payment will be made to the Contractor for repairing leaks not visible prior to bidding.

Cleaning, surface preparation, lining application, and thicknesses shall be as specified herein and shall meet or exceed the lining manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, the Contractor shall comply with the manufacturer's minimum recommendations.

RELATED SECTIONS

A. Section 02500 – Traffic Control
B. Section 02730 – Sanitary Sewer System
C. Section 02750 – Wastewater Flow Control
D. Section 02765 – Manhole Chimney Seals

REFERENCE STANDARDS

This Section contains references to the governing standards and documents listed below. They are a part of this Section as specified and modified; the current version shall apply unless otherwise noted. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.

A. American Concrete Institute (ACI)

a. ACI 224.1R – Causes, Evaluation and Repair of Cracks in Concrete Structures
b. ACI 301 – Specifications for Structural Concrete
c. ACI 308R – Guide to Curing Concrete
d. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary
e. ACI 515 – A Guide to the use of Waterproofing, Dampproofing, Protective, and Decorative Barrier Systems for Concrete
f. ACI 546.R – Concrete Repair Guide
g. ACI 546.3R – Guide for the Selection of Materials for the Repair of Concrete

B. ASTM International (ASTM)

a. ASTM C 868 – Standard Test Method for Chemical Resistance of Protective Linings
b. ASTM C 1583/1583M – Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)
c. ASTM D 2794 – Standard Test Method for Resistance of Organic Linings to the Effects of Rapid Deformation (Impact)
d. ASTM D 4060 – Standard Test Method for Abrasion Resistance of Organic Linings by the Taber Abraser
e. ASTM D 4285 – Standard Test Method for Indicating Water or Oil in Compressed Air
f. ASTM D 4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
g. ASTM D 4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages
h. ASTM D 4541 - Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
i. ASTM D 6944 Standard Test Method for Measuring Humidity with a Physchrometer
j. ASTM D 7682 – Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
k. ASTM F 1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
l. ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
m. ASTM F 2414 – Standard Practice for Sealing Sewer Manholes Using Chemical Grouting
n. ASTM G 210 – Standard Practice for Operating the Severe Wastewater Analysis Testing Apparatus

C. International Concrete Repair Institute (ICRI)

a. Guideline No. 310.1R – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
b. Guideline No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealer, Linings, and Polymer Overlays

D. National Association of Corrosion Engineers International (NACE)

a. NACE Publication 6D-173 – A Manual for Painter Safety
b. NACE SP0188 – Standard Practice for Discontinuity (Holiday) Testing of Protective Linings
c. NACE SP0892 – Standard Practice for Coatings and Linings over Concrete for Chemical Immersion and Containment Service
d. NACE No. 6/SSPC-SP13 – Surface Preparation of Concrete

E. Occupational Safety and Health Administration (OSHA)

a. Safety and Health Standards (29 CFR 1910/1926)

F. The Society for Protective Coatings (SSPC)

a. SSPC-SP13/NACE No. 6 – Surface Preparation of Concrete
b. SSPC-Guide 12 – Guide for Illumination of Industrial Painting Projects

G. Standard Practice for the Rapid Evaluation of Coatings and Linings by Severe Wastewater Analysis Test (S.W.A.T.)

Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents or the last version of the document before it was discontinued.

In case of conflicting requirements between this specification and these referenced documents, the more stringent shall govern.

SUBMITTALS

Submit, in accordance with Section 01300 – Submittals and Section 01000 – Special Conditions, letters, shop drawings, and product data showing materials of construction, installation equipment and details of installation for the monolithic lining system including:

1. Product Data Sheets: Copies of current technical data for each component specified and applied as outlined in this Section.

2. Safety Data Sheets: Copies of current SDS for any materials brought on-site including all clean-up solvents, repair or resurfacing mortars and lining materials.

3. Qualification Data: Approved Installer Training Certificates from manufacturer.

4. Performance Testing Reports: Copies of test data for the entire physical, chemical, and permeation properties listed herein and as outlined within this Section.

5. Installation Instructions: Manufacturer's written installation instructions for the materials specified in this Section.

6. Construction Details: Copies of manufacturer's computer generated standard lining details for specified materials, including: leading edge termination, metal embedment in concrete, joint detail, wall-to-slab detail, pipe termination detail, and any other detail at the request of the Public Works Commission.

GUARANTEE

The installed lining system shall be guaranteed by the Contractor and Manufacturer for a period of five (5) years from the date of final acceptance. During this period, all defects discovered in the lining, as determined by the Public Works Commission, shall be repaired or replaced in a satisfactory manner by the Contractor at no cost to the Public Works Commission. All proposed repairs shall be submitted, reviewed, and approved by the Public Works Commission prior to the Contractor completing any work.

QUALITY ASSURANCE

The supplier shall be responsible for the provisions of all test requirements specified in the above referenced ASTM Standards as applicable. In addition, all lining products to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the Public Works Commission. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all lining products and materials approved for this Contract shall be borne by the Public Works Commission.

Inspections of the lining products and materials may also be made by the Public Works Commission after delivery. The lining products and materials shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Lining materials rejected after delivery shall be marked for identification and shall be removed from the job at once.

The Contractor shall initiate and enforce quality control procedures in accordance with the applicable ASTM, National Association of Corrosion Engineers (NACE), the Society for Protective Coatings (SSPC) standards, and in accordance with the manufacturer's instructions.

Acceptable Manufacturers: A company with a minimum of five (5) years experience in manufacturing of, and providing technical service for chemical resistant systems equivalent to those specified herein.

The manufacturer of the lining system of manholes shall be a company that specializes in the design and manufacture of corrosion protection systems for manholes. The Contractor shall be completely trained in leak repair, surface preparation, installation of the lining system, and corrosion materials application on manholes. The lining system materials/products shall be suitable for installation in a severe hydrogen sulfide

environment without any deterioration.

The applicator shall be trained and certified by the manufacturer for the handling, mixing, application and inspection of the manhole lining system as described herein.

DELIVERY, STORAGE AND HANDLING

Care shall be taken in shipping, handling and placing to avoid damaging the lining products. Extra care may be necessary during cold weather construction. Any lining product or material damaged in shipment shall be replaced as directed by the Public Works Commission.

Any lining product showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.

While stored, the lining products shall be adequately packaged and protected. The lining products shall be stored in a manner as recommended by the manufacturer. The Contractor shall comply with the following:

1. Store the materials in sealed, original manufacturer's containers.
2. Store materials in a protected area out of direct sunlight.
3. Keep containers clean and undamaged.
4. Comply with manufacturer's published storage temperature and shelf life recommendations.
5. Protect all materials from freezing.

Deliver products to the job site in manufacturer's original, unopened containers bearing manufacturer's name and label and the following information

1. Product name.
2. Product description (generic product classification).
3. Manufacturer's lot number.
4. Color.

All materials shall be handled in accordance with their Safety Data Sheets (SDS) and the manufacturer's instructions.

PRODUCTS

The materials to be utilized in the lining of manholes shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. The manufacturer of corrosion protection products shall have a minimum of 10 years experience in the production of the lining products utilized and shall have satisfactory installation record. All rehabilitation products shall be manufactured by a single manufacturer, or the Contractor shall provide documentation that the materials are compatible with each other.

All lining materials shall be approved by U.S. EPA for sewer system rehabilitation.

The lining system shall be compatible with the thermal condition of the existing sewer manhole surfaces. Surface temperatures will range from 20°F to 100°F.

Any polymeric lining system that cannot provide test results of ASTM G 210 will not be approved for this application. (ASTM G 210– Standard Practice for Operating the Severe Wastewater Analysis Testing Apparatus).

The polymeric lining system shall provide a minimum service life of 50 years.

INFILTRATION CONTROL MATERIAL

Infiltration control materials shall be rapid-setting, high early strength, hand applied cementitious material for stopping infiltrating water and making repairs to concrete, brick or other masonry constructed manholes. The material shall be non-shrinking, non-metallic and non-corrosive. It shall be formulated at the factory and supplied in factory sealed and labeled pre-measured containers. The material shall be compatible with the lining material to be used. The material shall have the following minimum characteristics:

1. Compressive strength (in accordance with ASTM C-109):
   - 1 hour 1,000 psi
   - 1 day 2,400 psi
   - 7 day 3,500 psi
   - 28 day 4,500 psi

2. Tensile strength (in accordance with ASTM C-109):
   - 1 day 175 psi
   - 7 day 250 psi
   - 28 day 350 psi

3. Bond Strength (in accordance with ASTM C-321)
   - 30 minutes 50 psi
   - 1 day 85 psi

4. Freeze-Thaw Durability (in accordance with ASTM C-666)
   - 100 cycles no loss

5. Set Time (in accordance with ASTM C-191-92)
   - Initial 30 to 60 seconds
   - Final 1 hour

6. Shrinkage (in accordance with ASTM C-157) – 0%

Infiltration control material shall be CEMTEC Hydraulic Cement by A.W. Cook Cement; Mainstay ML-10 by Madewell Products Corporation; PLS-505 by Protective Liner Systems; Quad-Plug by Quadex; or approved equal.

Chemical sealants or grouts used to seal active manhole leaks, to patch cracks, to fill voids and to

otherwise prepare the manhole surfaces for the lining installation shall be suitable for the intended purpose and shall be compatible with the lining system as certified by the manufacturer.

All leaks shall be stopped prior to the installation of the lining system.

PATCHING MATERIAL

Voids in the existing manhole walls, benches, or damaged inverts must be repaired prior to installing the lining system. The patching material shall be a rapid setting, high early strength, corrosion resistant hand mixed and hand applied cementitious material intended for filling voids and repairing inverts in concrete, brick or other masonry constructed manholes. It shall be formulated in the factory and supplied in factory sealed and labeled pre-measured containers. The material shall be compatible with the lining material to be used. The material shall have the following minimum characteristics:

1. Compressive strength (in accordance with ASTM C-109):
   - 1 day 3,500 psi
   - 7 day 4,900 psi
   - 28 day 5,500 psi

2. Tensile strength (in accordance with ASTM C-109):
   - 1 day 200 psi
   - 7 day 250 psi
   - 28 day 550 psi

3. Freeze-Thaw Durability (in accordance with ASTM C-666)
   - 100 cycles no loss

4. Set Time (in accordance with ASTM C-191-92)
   - Initial 15 to 20 minutes
   - Final 20 to 25 minutes

Patching material shall be CEMTEC Rapid Cure Vertical Grade by A.W. Cook Cement; Mainstay ML-72 by Madewell Products Corporation; Hyperform by Quadex; or approved equal.

All voids and other repairs shall be completed prior to the installation of the lining system.

CEMENTITIOUS BASE COAT

The cementitious base coat shall be a pumpable Portland based 100% pure calcium aluminate cement. The lining shall be installed via trowel or low-pressure application. The materials shall be suitable for all the specified design conditions.

The cementitious base coat shall be a system suitable for use as a trowel- or spray-applied monolithic surfacing in sewer manholes. The cementitious lining system shall be Mainstay ML-CA by Madewell Products Corporation; Aluminaliner by Quadex; CEMTEC Silatec CAM by A.W. Cook Cement; PLS-507 by Protective Liner Systems; or approved equal.

The cementitious base coat shall be applied to the following minimum total thicknesses for all lining systems:

1. **For block and cast concrete manholes in good condition, apply to a minimum thickness of one-half (0.5) inch.**
2. **For all brick manholes and for block or cast concrete manholes in poor condition, apply to a minimum thickness of one (1.0) inch.**

It is the Contractor's responsibility to determine the required thickness of the cementitious base coat, based on the manhole condition, groundwater conditions, etc. to ensure the long-term integrity of the installed lining system.

The cementitious base coat shall be installed on the walls of existing manholes, from the invert to the manhole frame, as further directed below. All cementitious lining shall be troweled to consolidate the material, and then brushed to provide a profile surface for application of the polymeric topcoat. The initial trowelling shall be done in an upward motion, to compress the material into voids. The Contractor shall ensure that the cement is not over-troweled. The cured cementitious base coat surface shall be continuous with proper sealing connections to all unsurfaced areas. The Contractor shall take all measures to ensure that the cementitious base coat properly cures. The use of curing compounds is prohibited.

The materials used in the cementitious base coat shall be mixed on site in accordance with the manufacturer's recommendations. Water shall only be added to the materials during the mixing process and prior to material pumping or spray application. No water shall be added at the nozzle.

The cementitious base coat, when cured, shall have the following minimum characteristics at 28 days as measured by the applicable ASTM standards referenced herein:

1. Density (when applied) – 135 pounds/cubic foot, plus/minus 5 pounds/cubic foot

2. Compressive strength (in accordance with ASTM C-109):
   1 day 2,800 psi
   28 day 8,000 psi

3. Bond Strength (in accordance with ASTM C-321)
   28 day 1,700 psi

4. Flexural Strength (in accordance with ASTM C-78)
   28 day 1,500 psi

5. Shrinkage (in accordance with ASTM C-157) – 0%

6. Freeze-Thaw Durability (in accordance with ASTM C-666)
   300 cycles no loss

The cured cementitious base coat shall be continuously bonded to all the brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside the sewer manhole.

Where the manhole to be rehabilitated is subject to vehicular traffic, the cementitious lining shall be installed to no closer than one (1) inch below the bottom of the manhole frame so as to avoid transfer of impact loads to the new liner. Where the manhole to be rehabilitated is not subject to vehicular loads, the cementitious liner shall be continuous up to the manhole frame.

POLYMERIC LINING SYSTEM

Materials

The lining system top coat shall be a polymeric system suitable for use as a trowel- or spray-applied monolithic surfacing in sewer manholes. The polymeric lining system may be a two part 100% solids epoxy, epoxy mortar or polyurethane resin system. Accepted manufacturers are:

Epoxy Systems:	Mainstay DS-5 Epoxy by Madewell Products Corporation; PLS-614 by Protective Liner Systems; Raven 405 by Raven Lining Systems; Dura-Plate 5900 HB Epoxy by Sherwin-Williams; Dura-Plate 6100 HP Epoxy by Sherwin-Williams; or approved equal.
Epoxy Mortar:	Dura-Plate 5900 HB Epoxy Mortar by Sherwin-Williams; or approved equal.
Polyurethanes:	Sher-Flex by Sherwin-Williams; or approved equal.

The lining system top coat shall be a 100% solids, epoxy polymer protective barrier material specifically designed to protect concrete and steel surfaces in severe wastewater environments, including associated abrasive physical attack and chemical attack from sewer gases and organic acids generated by microbial sources.

Epoxy lining shall be capable of achieving the specified thickness in a single coat application.

The polymeric top coat materials shall be applied by low pressure spray or hand applied to the minimum dry film thickness of 150 mils.

The polymeric materials shall be suitable for sewer system service and chemically resistant to any chemicals or vapors normally found in domestic and/or commercial sewage. The polymeric material shall be compatible with the cementitious base coat material, as per manufacturer's recommendations.

Installation

The polymeric lining system shall be installed over the cementitious base coat previously applied on the inverts, benches, and walls of the designated manholes. The polymeric liner shall be applied only after the cementitious base coat has properly cured, in accordance with the manufacturer's instructions.

The Contractor shall saw-cut the existing walls, benches, and/or inverts in order to "tie-in" the polymeric lining.

The cured surface of the polymeric lining system shall be smooth and continuous with proper sealing connections to all unsurfaced areas. The sprayed-on liner shall be troweled to consolidate the product into the profile of the substrate or resurfacing mortar.

When cured, the monolithic polymeric lining system shall form a continuous, tight-fitting, hard, impermeable surfacing which is suitable for sewer system service and chemically resistant to any chemicals or vapors normally found in domestic sewage. The polymeric lining shall be continuously bonded to the cementitious base coat.

Where the manhole to be rehabilitated is subject to vehicular traffic, the polymeric lining system shall be installed to no closer than one (1) inch below the bottom of the manhole frame so as to avoid transfer of impact loads to the new liner. In those locations where the manhole is subject to vehicular traffic, a chimney seal shall be installed to "bridge" the gap between the manhole frame and the polymeric lining system. Where the manhole to be rehabilitated is not subject to vehicular loads, the polymeric lining system shall be continuous up to the manhole frame. **The polymeric lining system shall not be applied to the manhole frame.**

SPECTRASHIELD LINING SYSTEM

In addition to the above products and materials, the "Spectrashield" lining system as furnished by CCI Spectrum, Inc. is an approved equal. All products and materials for the "Spectrashield" lining system shall be in accordance with CCI Spectrum, Inc. requirements. Manhole preparation shall be in accordance with the following:

- Stop all active leaks and infiltration utilizing an approved infiltration control material
- Patch all voids in the manhole utilizing an approved patching material
- Install the "Spectrashield" lining system to build back the manhole profile (the minimum thickness shall be **500 mills**)

All work shall be in accordance with these Contract Documents and as directed by the Public Works Commission.

INSTALLATION

GENERAL

All work shall be in accordance with these Contract Documents and as directed by the Public Works Commission.

The Contractor shall take appropriate action to comply with all local, state and federal regulations including those set forth by OSHA, EPA, the Public Works Commission and any other applicable authorities.

Prior to conducting any work, the Contractor shall perform an inspection of the structure to determine any need for protection against hazardous gases or oxygen depleted atmosphere and the need for flow control or flow diversion.

The Contractor shall clean each sewer manhole and shall properly dispose of any resulting material. The Contractor shall take sufficient precautions prevent any debris from their operations to enter the sewer system.

All surface washing, abrasive blasting, waterjetting, grinding, patching, filling and preparation shall be completed by the Contractor in accordance with the lining system manufacturer's recommendations.

The Contractor shall notify all property owners who discharge sewage directly to the manhole being rehabilitated that their service will be discontinued while the lining system is being installed, cured and active pipe and service connections reopened. The Contractor shall notify individual property owners at least 48 hours in advance, giving the date, start time and estimated completion time for the work being conducted.

Application procedures shall conform to recommendations of the manufacturer, including materials handling, mixing, environmental controls during application, safety and spray equipment. Material shall not be applied during freezing weather conditions. No material shall be placed when the ambient air temperature is below 40°F, or when the temperature is anticipated to fall below 32°F in the next 24 hours.

Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

SURFACE PREPARATION

Surface preparation methods may include high pressure water cleaning, hydro blasting, abrasive blasting, grinding, detergent water cleaning, and shall be suited to provide a surface compatible for installation of the liner system. Remove all dust, biological growths, grease, oil, paint or any other surface contaminants or coatings from all surfaces to be lined, including manhole walls, corbelling and manhole frame. The choice of surface preparation lies solely with the Contractor. The Contractor shall determine the required surface preparation method based upon the condition of the manhole, the presence of potential contaminants, access to perform the work, and the required condition of the surface to apply to specified lining system, as required by the manufacturer.

The surface preparation method shall produce a cleaned, abraded and sound surface with no evidence of laitance, loose concrete, brick or mortar, contaminants or debris, and shall display a surface profile suitable for application of the manhole lining system. The Contractor shall prepare the surface in accordance with the applicable NACE and/or SSPC recommendations for the specified lining system.

Coatings that cannot be removed shall be properly prepared (in accordance with these Specifications) to obtain and insure adequate bonding of the cementitious base coat material.

The Contractor shall conduct a visual inspection of each manhole after it is cleaned. All active infiltration leaks shall be plugged or sealed with an appropriate infiltration control material compatible with the cementitious base coat. The Contractor shall remove all loose mortar and rubble from existing walls, benches and inverts. Repairs to exposed rebar, defective pipe penetrations or inverts, etc. shall be repaired utilizing non-shrink grout or approved alternative method. The Contractor shall prepare manhole to receive the cementitious base coat as necessary by reshaping and repairing benches, inverts, and walls where required. All interior surfaces shall be prepared as recommended by the base coat lining manufacturer. Minimum requirements are as listed below.

1. All cracks and other voids must be repaired and filled with suitable non-shrinking cements, sealants or grouts, including all voids between the existing sewer pipes and manhole walls. Patching compounds shall be compatible with the proposed lining system. All patches shall be smooth and even with the manhole wall.
2. All existing manhole rungs/steps shall be removed and the void patched or cut off and ground smooth.
3. All surfaces shall be suitably prepared for the required bonding of the cementitious base coat as recommended by the manufacturer.

Concrete surfaces to be coated shall be free of curing compounds and form release agents, laitance and foreign particles that may inhibit bonding. Prior to the start of the protective coating system application, the Contractor shall pre-clean as required, and inspect the substrate in accordance with SSPC-SP13/NACE No. 6, Severe Service. Surface preparation procedures shall be in accordance with NACE SP0892, SSPC-SP13/NACE No. 6 and ICRI Guideline No. 310.2. Surface preparation shall expose aggregate and obtain a uniform surface texture resembling the minimum recommended concrete surface ICRI-CSP profile. The Contractor shall remove all dust, biological growths, grease, oil, paint or any other surface contaminants or coatings from all surfaces to be lined, including any metal work to be coated.

Existing Concrete Application: Existing concrete structures to receive the protective coating system must be capable of withstanding imposed loads. All oil, grease, waste and chemical contaminants shall be removed from the surface of the concrete prior to preparation in accordance with NACE SP0892 and SSPC-SP13/NACE No. 6. Concrete surfaces must be sound and capable of supporting the proposed polymeric lining system. Surface preparation requirement is to expose a sound, uniform surface texture confirming to the minimum recommended ICRI-CSP. The appropriate cementitious repair mortar or epoxy cementitious repair material shall be applied to the entire, prepared surface to level surface suitable for coating.

Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the Contractor, and will produce a finished product meeting the requirements of these Contract Documents. All defects resulting from accepted conditions shall be corrected by Contractor at his own expense.

All concrete surfaces shall be prepared to a minimum of SSPC-SP13 prior to installation of the polymeric lining system.

Level or grind concrete substrates to produce a uniform and smooth surface, including removal of all sharp edges, ridges, form fins, and other concrete protrusions.

FLOW CONTROL

It is the intent of these Contract Documents that the Contractor will utilize flow-through plugs or other means to complete the manhole rehabilitation without the use of a temporary sewer bypass system. All temporary flow-through plugs shall be removed upon the completion of each step of the rehabilitation process (cementitious base coat, polymeric top coat). The Contractor shall be responsible for ensuring that their flow control system does not result in any sanitary sewer being discharged to the environment.

If required to properly complete the lining, the Contractor shall provide temporary bypass pumping of sewage flows where and when the rehabilitation work is being performed. The temporary bypass pumping shall be in accordance with Specification Section 02750 – Wastewater Flow Control and these Contract Documents.

INFILTRATION CONTROL

After surface cleaning, any visible leaks or infiltration shall be stopped, prior to installation of any patching material or the cementitious base coat. Infiltration and leaks shall be stopped utilizing hydraulic cement or other "typical" methods (i.e., oakum). It is the intent of these Contract Documents that the Contractor will take all necessary steps to stop all but the very large leaks without the use of chemical grout. Should a significant, very large leak be encountered that would require significant effort, large quantities of chemical grout, and/or other extreme measures, the method and cost to stop that leak shall be mutually agreed upon by the Contractor and the Public Works Commission, prior to commencing work.

A complete, watertight seal shall be provided at pipe and manhole wall connections. The Contractor shall submit details of how the watertight connections will be made to the Public Works Commission for review and approval.

REPAIR OF BENCHES AND INVERTS

The Contractor shall complete any necessary repairs to the bench and/or invert of the manhole, prior to installation of the specified lining system. All repairs shall be completed in accordance with the requirements of the Public Works Commission, and as outlined herein.

The invert channel shall be constructed of brick and mortar, in accordance with Public Works Commission standard details. The invert channel shall be smooth and semicircular in shape conforming to the inside of the connecting sewer section. Changes in direction of flow shall be made with a smooth curve as large as a radius as the size of the manhole will permit without a decrease in flow velocity. Changes in size and grade of the channel shall be made gradually and evenly. A shelf shall be provided on each side of any manhole invert channel. Inverts in manholes with standing water will not be acceptable.

CEMENTITIOUS BASE COAT

The Contractor shall furnish and place the cementitious base coat in each manhole as and where directed by the Public Works Commission. The installation of the cementitious base coat shall be in complete accordance with the manufacturers' specifications.

Prior to placing the cementitious base coat, the Public Works Commission and the Contractor must inspect and approve the surface preparation work. The Contractor shall notify the Public Works Commission when the manholes are ready for inspection. The Contractor is responsible for ensuring proper installation conditions including surface preparation, temperature, and moisture.

All bottom and horizontal surfaces shall have the cementitious base coat material applied to the required thickness by hand troweling or spray-on methods. <u>All</u> cementitious lining shall be troweled to consolidate the material, and then brushed to provide a profile surface for application of the polymeric

topcoat. The initial troweling shall be done in an upward motion, to compress the material into voids.

All side vertical surfaces shall have the cementitious base coat applied to the required thickness in one pass or application. Non-vertical surfaces may be completed in multiple passes to prevent sloughing of material.

Temperature limitations must be handled as appropriate and as approved by the manufacturer.

POLYMERIC TOP COAT

The Contractor shall furnish and place the polymeric lining over the previously installed cementitious base coat and all other surfaces to be lined, and as may be directed by the Public Works Commission. The installation of the polymeric lining top coat shall be in complete accordance with the applicable provisions of the manufacturers' specifications.

The Contractor shall provide documentation that the mixing of materials is in accordance with the manufacturer's instructions.

Prior to placing the top coat, the Public Works Commission and the Contractor must inspect and approve the cementitious base coat. The Contractor shall notify the Public Works Commission when the manholes are ready for inspection. The Contractor is responsible for ensuring proper installation conditions including cementitious base coat conditions, temperature and moisture.

The Contractor shall saw-cut the existing walls, benches, and/or inverts in order to "tie-in" the polymeric lining.

All surfaces shall have the monolithic polymeric lining applied by a spray-on method or by hand troweled applications in multiple passes to gradually build up to the required thickness.

Temperature limitations must be handled as appropriate and as approved by the manufacturer.

SPECTRASHIELD LINING SYSTEM

Installation of the "Spectrashield" lining system, as furnished by CCI Spectrum, Inc. shall be in accordance with the manufacturer's requirements. Manhole preparation shall be in accordance with the requirements outlined in these Contract Documents.

FIELD QUALITY CONTROL

The Contractor to perform the quality control procedures listed below in conjunction with the requirements of this Specification Section.

A. Inspect all materials upon receipt to ensure that all are supplied by the approved Manufacturer.

B. Surface pH Testing: The pH of the concrete substrate will be measured using pH indicating papers. The pH testing is to be performed once every 50 square feet. Acceptable pH values shall be a minimum 9.0 as measured using color indicating pH paper with readable color calibrations and a

scale at whole numbers (minimum). Use Hydrion Insta-Check Jumbo 1-12, or approved equal. The paper shall be touched to the surface once using moderate gloved finger pressure. The surface shall not be wiped or moved laterally to disturb the surface during pH testing. Following the one touch, lift the paper vertically to not "wipe" the surface. Compare the color indicated with the scale provided and record the pH. Spot check any questionable areas with a 1% phenolphthalein solution. The phenolphthalein solution shall turn bright pink on concrete.

TESTING

During application of the polymeric top coat, the Contractor shall measure the thickness and uniformity of the material by the use of a wet film thickness gage meeting the requirements of ASTM D 4414. Measurements shall be completed in the presence of the Public Works Commission. The Contractor shall document all measurements for each manhole and submit the documentation to the Public Works Commission. The documentation shall be submitted with each pay application.

Field acceptance of the manhole lining system shall be based on the Public Works Commission's evaluation of the appropriate installation of the base coat and top coat per field inspections and on observation of the measurements of the wet film thickness. Acceptance shall also be based on the Public Works Commission's evaluation of the curing test data and final testing.

The polymeric lining top coat shall provide a continuous monolithic surfacing with uniform thickness throughout the manhole interior and be free of pinholes, slumps and drips. A visual inspection shall be conducted to ensure that no pinholes are in the monolithic coating. The visual inspection shall include terminations and transitions of the polymeric liner.

Once the lining system has fully cured, it shall be checked via high voltage spark detection, in accordance with NACE SP0188 and the manufacturer’s instructions. All defects shall be corrected at no cost to the Public Works Commission. The high voltage spark detection shall be done in accordance with:

1. The manhole environment shall be properly vented prior to testing to ensure hazardous conditions do not exist.
2. The high voltage spark detection equipment shall be set at 100 volts per one (1) mil of of applied film thickness, or as recommended by the manufacturer.
3. All detected holidays shall be marked and the area of the liner shall be repaired. The surface area around the defect in the liner shall first be abraded using an appropriate grit paper or other hand abrasion tool. After abrading and cleaning the area, the area shall be patched by hand application of the polymeric lining topcoat material. All repair procedures shall follow manufacturer’s recommended procedures.
4. All repaired areas shall be spark tested.

The Contractor is expected to perform preliminary spark testing prior to scheduling a final test with the Public Works Commission. Any defects noted during this preliminary testing shall be repaired in accordance with these specifications and the manufacturer’s recommended procedures.

ACCEPTANCE

The Public Works Commission shall complete a final inspection of each manhole, to include a visual

inspection to verify that no leakage through the manhole wall is occurring, the manhole has been rehabilitated in accordance with the Contract Documents, and witness the final spark test. The Public Works Commission shall visually inspect every manhole and shall observe the final spark testing for every manhole. The Contractor shall coordinate with the Public Works Commission to schedule the final inspection. Any deficiencies noted during the final inspection shall be repaired in accordance with these specifications and the manufacturer's recommended procedures.

Inspection by the Public Works Commission does not absolve the Contractor from their responsibility for quality control inspection and testing as specified in these Contract Documents or as required by the manufacturer's instructions.

There shall be no groundwater infiltration or other leakage through the manhole wall after it has been lined. If leakage is found, it shall be eliminated with an appropriate method as recommended by the liner manufacturer and approved by the Public Works Commission. Any leakage shall be sealed utilizing materials compatible with the lining system, in accordance with the manufacturer's directions, and as approved by the Public Works Commission. The repair materials shall have the same life expectancy of the installed lining system. All repair materials shall be properly cured in accordance with the manufacturer's instructions. The use of curing compounds is prohibited.

All pipe connections shall be open and clear.

There shall be no cracks, voids, pinholes, slumps, drips, uncured spots, dry spots, lifts, delaminations or other type defects in the lining. The polymeric lining shall provide a continuous monolithic surface with uniform thickness throughout the manhole.

If any defective lining is discovered after it has been installed, it shall be repaired or replaced in accordance with the manufacturer's recommendations and in a satisfactory manner to the Public Works Commission. This requirement shall apply for the entire guarantee period.

The Contractor shall demonstrate that the installed lining system does not interfere with the proper sealing and locking (as applicable) of the manhole cover. Upon completion of the spark testing, all manholes shall be locked (if so equipped). For those manholes within paved areas, the Contractor shall apply four (4) dollops of roofing tar to the frame, to eliminate the cover from rattling. The dollops shall be equally spaced around the frame. The Public Works Commission Project Coordinator shall verify that the manholes are secured (locked and/or tarred).

At the completion of the Work, the Contractor shall remove all materials and debris associated with the Work of this Section.

The Contractor shall clean all surfaces not designated to receive the specified lining system. The Contractor shall restore all other work in a manner acceptable to the Public Works Commission.

The installed lining system shall be protected from damage until Final Acceptance of the Work. Any damage to the installed lining system shall be repaired or replaced at the discretion of the Public Works Commission, at no additional cost to the Public Works Commission.

*** END OF SECTION ***