Jacobs

Macon Water Authority

Addendum No.2

Lower Rocky Creek WRF 42" & 24" Gravity Sewer Rehabilitation

Macon, Georgia,

Date: September 18, 2025

This addendum forms a part of the Contract Documents and modifies the original Specifications and Contract Documents as noted below. Acknowledge receipt of this addendum in the space provided on the Bid Form. Failure to do so may result in disqualification of the bidder.

The following additions/changes modify the Request for Proposal for the referenced project, dated August 21, 2025.

Clarifications

C1. **Specification 33 01 30.90(1.02)(B)(1)** Delete the following text: "Strong-Seal High Performance."

C2. **Specification 33 01 30.90(1.02)(B)(3)** Delete the following text: "Tnemec Epoxy Series."

C3. **Specification 33 01 30.90(1.04)(C)(1)(i)** Replace with the following text: "Cementitious Mortar Lining".

C4. **Specification 33 01 30.90(1.04)(D)(7)** Replace with the following text: "Cementitious Mortar Lining".

C5. **Specification 33 01 30.90(1.04)(D)(8)(b)** Replace "Epoxy Lining Resin" with the following text: "Cementitious Mortar Lining".

C6. **Specification 33 01 30.90(2.01)(A)** Delete this section in its entirety.

C6. **Specification 33 01 30.90(2.01)(E)** Delete this section in its entirety.

C7. **Specification 33 01 30.90(2.01)(G)(2)** Delete the following text: "Epoxy" and "Minimum 350 Mils".

C8. **Specification 33 01 30.90(2.04)** Remove this section in its entirety.

C9. **Specification 33 01 30.90(3.03)(C)** Remove this section in its entirety.

C10. **Specification 33 01 30.90(3.06)(D)** Remove this section in its entirety.

Questions

Q6. ASTM F2019 is referenced as a standard for CIPP in the specifications. Can the Engineer please confirm that UV liner is an acceptable installation and confirm that F2019 is an acceptable design parameter?

A6. ASTM F1216 is the specified design standard, as noted in the plan and profile views. UV-cured lining is acceptable provided the Contractor follows ASTM F2019 and ensures that it meets the ASTM F1216 design criteria.

Q7. Will water for cleaning and lining of the pipes be made available by the Owner?

A7. No, The Contractor is responsible for providing water required for cleaning and lining of the pipes. The Contractor may obtain a hydrant meter from MWA. There is a cost associated with this service.

Q8. Can the Owner identify a location for the disposal of sand/debris from the pipe cleaning operations?

A8. MWA may have limited space available for disposal of sand and debris from pipe cleaning operations; however, this availability is not guaranteed. The Contractor is responsible for identifying and utilizing an offsite disposal facility approved for hazardous waste.

Q9. Could you please provide a link to existing videos / CCTV logs for this scope?

A9. Jacobs will provide a link for plan holders to download available CCTV inspection data.

Q10. If gravel access roads are installed along the existing sewer easement, will they be allowed to remain in place following construction for future Authority use, or will they need to be removed post construction?

A10. Access improvements will be permitted to remain in place after construction is completed as long as it is on the easement and approved by the property owner.

Q11. Will the Owner locate and expose existing manholes prior to construction?

A11. No, Contractor will be responsible for locating all manholes

Q12. Do you have any flow data available? If not, is there a required flow rate that the bypass system must be set up for, or is upon the contractor to bypass flows safely and effectively at their discretion based on site visits and conditions at the time of need?

A12. Contractor to assume full flow pipe to estimate bypass flow capacity and pumping needs.

Q13. For CIPP design calculations, should HS20 Live Load be used for all segments, or only those under existing roadways?

A13. Use E-80 live load for segments under the railroads. Use HS20 for other segments, including those under unpaved service roads.

Q14. Will the Owner accept UV cured liners?

A14. Please refer to response to Q6.

Q15. If an easement needs to be cleared prior to work, will the Owner consider adding a line item for the easement clearing?

A15. No, a separate line item will not be included for easement clearing.

Q16. What is the Owner's budget for the project?

A16. The project budget is $18.6M. A detailed OPCC will not be provided.

Q17. Several sections of this project are located in a wet area, if the contractor has to well point, will the Owner add a pay item for well pointing?

A17. No, dewatering is considered part of the contractors means and methods. MWA will not add a separate pay item for well pointing.

Q18. After CCTV/cleaning is completed and a point repair is needed, will the Owner add a pay item for external point repairs?

A18. Owner's controlled contingency would be used for any repairs or differing conditions identified in the field, at the discretion of the Owner.

Q19. What are the peak/ average flows for the Lower Rocky Creek 42", 24" and Edna Place 21" sewer?

A19. Assume full pipe flow. Edna Place should be estimated as a 24" full pipe flow.

Q20. Is an encroachment permit required for Norfolk Southern? If so, who will be responsible for applying and paying permit fees?

A20. Contractor prepares the application. MWA will submit and pay associated fees.

Q21. What are the flow rates for the 8"and 10" force main on map page C-202. Assumed flow from Armstrong World Industrial Inc.; Please include both dry and wet weather peak flows.

A21. Armstrong World Industrial Inc. connection is from toilets at the facility. Average flow is approximately 2,000 GPD (Mon–Fri), and approximately 500 GPD on weekends.

Q22. Which Tnemec Epoxy Series is approved for manhole rehabilitation?

A22. MWA prefers SewperCoat to be used for all manhole rehabilitation. Specification 33 01 30.80 has been updated to remove Tnemec Expoxy Series as an approved product for manhole rehabilitation.

Q23. Will flow data be provided to bidders?

A23. See response to question Q19

Q24. Will GIS Information be made available to bidders?

A24. Jacobs will provide a link for plan holders to download available GIS information.

Q25. What is the expected timeline for Construction start following award?

A25. MWA is anticipating to present recommendation for Award at the October 2nd Board Meeting. Generally, construction start is expected within 10 days from Board approval.

Q26. Will MWA make the project budget available for project?

A26. See Response to Q16

Q27. Will the Pre-Bid Conference Sign-In sheet be posted?

A27. Yes, the sign-in sheet will be included as part of Addenda 02.

Q28. Is there a person identified from NS to handle permitting?

A28. Permit applications are submitted through RailPros. Norfolk Southern will not discuss the project until the application has been submitted.

Q29. Where does the sewer alignment cross the Norfolk Southern railroad easement.

A29. The Norfolk Southern easement is shown on sheet 05-C-202.

Q30. If the bidder meets the 10% minority goal, are they still required to solicit?

A30. If the bidder meets the 10% minority participation goal, additional solicitation efforts are not required.

No fee adjustment shall be made for a failure to understand, or for a misinterpretation of the contract documents.

REQUIRED CONFIRMATION OF RECEIPT:

Acknowledge receipt of this addendum by return e-mail and as required on the Bid form *"Section 00300-3" of the contract documents.

Jacobs

Sign-In Sheet

Pre-Bid Conference
September 16, 2025 10:00 am

Lower Rocky Creek WRF 42" & 24" Gravity Sewer Rehab

Name	Company	Email
Joel Herndon	MWA	Jherndon@MACONWATER.org
Gene Inman	MWA	ginman@MACONWATER.org
Johnny Rogers	Sunbelt Rentals Pump Solution	Johnny.Rogers@SunbeltRentals.com
Roslyn D. Johnson	MWA	rjohnson@maconwater.org
CARL Smith	Cajenn Const.	CSmith@Cajenn.com
Doug Helmly	Augusta Inc.	d.helmly@augustaIndustrial.com
Jon Canon	Insituform Technologies	jcanon@azuria.com
Cortez Rankin	Gulf Coast Underground (GCU)	ddavis@gpgca.com

Jacobs

Sign-In Sheet

Pre-Bid Conference
September 16, 2025 10:00 am

Lower Rocky Creek WRF 42" & 24" Gravity Sewer Rehab

Name	Company	Email
Jerri Sumlin	SAK Construction	bidclippe@sakcon.com
Kevin Kelley	Mersino Water Solutions	Kevin.Kelley@mersino.com
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Mike Beard	MWA	mbeard@maconwater.org

Jacobs

Sign-In Sheet

Pre-Bid Conference
September 16, 2025 10:00 am

Lower Rocky Creek WRF 42" & 24" Gravity Sewer Rehab

Name	Company	Email
David Raymond	Insituform Technologies	draymond@azuris.com 904-465-3267
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Chris Vogus	MERSINO	christopher.vogus@mersino.com atlanta.sales@mersino.com
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SECTION 33 01 30.80
MANHOLE REHABILITATION

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
   a. C109/C109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50 mm) Cube Specimens).
   b. C144, Standard Specification for Aggregate for Masonry Mortar.
   c. C150/C150M, Standard Specification for Portland Cement.
   d. C293/C293M, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
   e. C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   f. C348, Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
   g. C413, Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   h. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
   i. C495 Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
   j. C496/C496M, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
   k. C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   l. C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes.
   m. C596, Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
   n. C631, Standard Specification for Bonding Compounds for Interior Gypsum Plastering.
   o. C666/C666M, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
   p. C924, Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

q. C952, Standard Test Method for Bond Strength of Mortar to Masonry Units.
r. C1202, Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration.
s. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
t. D1042, Standard Test Method for Linear Dimensional Changes of Plastics under Accelerated Service Conditions.
u. D2834, Standard Test Method for Nonvolatile Matter (Total Solids) in Water-Emulsion Floor Polishes, Solvent-Based Floor Polishes, and Polymer-Emulsion Floor Polishes.
v. D3574, Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams.
w. D4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
x. D4542, Standard Test Method for Pore Water Extraction and Determination of the Soluble Salt Content of Soils by Refractometer.
y. F2551, Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes

2. NACE International, (NACE): SP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
3. The Society for Protective Coatings (SSPC): SP 10, Near-White Metal Blast Cleaning.
   a. SP 13, NACE No.6, Surface Preparation of Concrete.

1.02 DESCRIPTION

A. This specification covers work, materials, equipment and tools including specially developed application equipment as required for installation and testing of a field applied unique monolithic interior manhole surfacing system. The use of specialized application equipment combined with rigorous surface preparation requirements shall be used to apply the products without the use of solvents. Product application requirements and procedures described include surface preparation, mixing, application, material handling and storage, qualification of the applicator and application quality control.

B. Product Description: The lining system shall be a spray-applied polymer monolithic surfacing system for use in rehabilitation of sanitary sewer manholes and structures. The lining system shall be one of the following products:

1. Sewpercoat.
2. “Or-equal” pre-approved.

C. This specification is for polymer and/or cementitious manhole lining systems (i.e. epoxy and polyurethane typesystems). The manufacturer of the lining shall furnish an affidavit attesting to the successful use of its material as a lining for concrete structures for a minimum period of 5 years in wastewater conditions recognized as corrosive or otherwise detrimental to concrete. The product must have an equivalent of 10,000 vertical feet (VF) of 48 inches or larger sanitary sewer manholes installation history.

D. Prior pre-approval is required to determine if the prospective product may be bid on this project. Without prior pre-approval within the specified time frame a product may be rejected as unacceptable. This time frame allows the Engineer ample time to determine if the proposed product is an acceptable alternative.

1.03 DEFINITION

A. The term applicator as used herein shall describe a private contractor hired to perform designated manhole restoration with personnel trained for the specific application.

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance to the applicable portions of these specifications. Submittals must be stamped by a P.E. licensed in the State of Georgia. Qualification and Performance Responsibility of Applicator: Applicator shall provide documentation that Applicator is an approved installer and licensed by the monolithic surfacing manufacturer and specialized equipment supplier.

B. The Applicator shall apply the system and be responsible for the complete performance of the system, including materials, application and quality control. The Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC standards. The Applicator shall use an adequate number of skilled individuals who are thoroughly trained and experienced in the necessary crafts. The crew on-site shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this section. The Applicator shall use approved equipment adequate in size, capacity and number sufficient to accomplish the work in a timely manner.

C. Action Submittals:

1. Manufacturer’s literature describing the following:
   a. Rehabilitation system.
   b. Equipment components.
   c. Material/chemical properties.
   d. Mixing and proportioning requirements.
   e. Maximum pot life.
   f. Film/coating thickness.
   g. Curing.
   h. Environmental requirements for application.
   i. Cementitious Mortar Lining:
      1) Specifications.
      2) Characteristics.
      3) Properties.
2. Shop Drawings showing termination of lining on vertical surfaces, corners, wall joints, overhangs, support beams, and wall penetrations.

D. Informational Submittals:

1. Pre-CCTV and post-CCTV inspection videos and data as specified in Section 33 01 30.16, Television Inspection of Sewer Pipelines.
2. Description, layout, and application sequencing plan.
3. Manufacturer’s Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements for specified materials.
4. Product manufacturers’ certification that each proposed rehabilitation product is compatible with the other.
5. Material Safety Data Sheets (MSDS).
6. Prior to delivery, provide manufacturer’s instructions for materials requiring special shipping, storage, or handling requirements.
7. Cementitious Mortar Lining:
   a. Type test performed information.
   b. Method of installation.
8. Qualifications:
   a. Manhole rehabilitation manufacturer’s certification stating installer is approved to install specified rehabilitation system.
   b. Cementitious Mortar Lining: List of references substantiating applicator’s experience.
   c. Underlayment trowel applicators.
   d. Lining spray applicators.
9. Manufacturer’s application instructions.
10. Manufacturer’s repair instructions.
11. Testing, certification, and warranty sample statements.

12. Detailed instructions and methodology for finishing pipe and manhole connections to rehabilitated manholes.
13. Confined space entry plan and training certificates for all individuals entering manholes or confined space structures.
14. Plan for capturing extraneous debris during rehabilitation processes and debris disposal.
15. Test Results:
    a. Epoxy Lining Applications:
        1) Lining and vacuum test results.
        2) Spark testing results

1.05 QUALITY ASSURANCE

A. Applicator's Experience:

1. Minimum 5 years' experience in application of specified products.
2. Project References:
    a. Projects successfully completed, incorporating not less than 250 manholes which were successfully performed within last 10 years.
    b. Include name of agency, agency contact, project name, and project date.

B. Personnel Qualifications for Chimney Repairs and Lining Procedures:

1. Certified within last 2 years by lining manufacturer.
2. Three projects within previous 2 years with similar lining systems.

C. Superintendent: Minimum 5 years as a superintendent.

D. Underlayment Trowel Applicators:

1. Minimum 3 years' continuous experience on similar type trowel underlayment projects.
2. Certified/trained by underlayment manufacturer.
3. Demonstrate, prior to start of underlayment application, capability of troweling underlayment in manner that yields a strong, uniform, well-bonded substrate for lining application.

E. Lining Spray Applicators:

1. Minimum 3 years' continuous experience on similar type multiple component lining projects.
2. Certified/trained by lining manufacturer.

3. Demonstrate, prior to start of lining application, capability of applying lining material in manner that yields a strong, uniform thickness, well bonded, pin-hole free coating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver lining products to Site in unopened containers that plainly show, at time of use, product name, date of manufacture, batch number, and name of manufacturer.

B. Store lining products in protected area with heating or cooling to maintain temperatures within range recommended by lining manufacturer. Materials are to be kept dry, protected from weather and stored under cover and stored between 50 degrees F and 100 degrees F. Materials should not be stored near flame, heat or strong oxidants. Protective coating materials are to be handled according to their material safety data sheets.

1.07 SPECIAL GUARANTEE

A. Provide manufacturer’s extended guarantee or warranty, with the Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at option of the Owner, removal and replacement of Work specified in this specification section found defective during a period of 10 years after date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.

B. Perform an internal condition survey 1 year following installation of repair. Should fault be found with repair, fault shall be rectified as specified by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Sewpercoat: A proprietary pre-blended mixture of acid resistant ready to use mortar specifically designed to withstand corrosion related to hydrogen sulfide as well as abrasion as manufactured by LaFarge Calcium Aluminates, Inc. The material is designated as Sewpercoat or an approved equivalent.

B. Flex-Seal: A propriety corrosion resistant aromatic flexible urethane resin to be applied internally to the wall of the adjustment ring. The material is specifically known as Flex-Seal Utility Sealant as manufactured by Sealing Systems, Inc. or “Or-equal” approved.

C. Water: Water mixed with these materials shall be clean and potable.

D. Other Materials: No other material shall be used in conjunction with or added to the selected material.

E. Interior Surfacing System:

1. The interior surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe and other manhole surfaces inside the manhole according to ASTM C882 testing and therefore shall be designed for hydrostatic loading.
2. The finished system shall provide the following minimum coverage:

Application	Cementitious Mortar Lining
Existing Manhole and Structure	Minimum 0.5 Inch, depending on the depth of application.

3. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in conformance with the recommendations of the monolithic surfacing system manufacturer. When cured, the system shall form a continuous, tight-fitting hard, impermeable surfacing that is suitable for sewer system service and resistant to any chemicals, bacteria or vapors normally found in municipal sewage. The system shall effectively seal the interior surfaces of the manhole and prevent any penetration or leakage of groundwater infiltration. The system shall be compatible with the thermal conditions of the existing sewer manhole surfaces.

F. Protective Coating Application Equipment:

1. The contractor shall use equipment designed for use in the spray or spin-cast application of the specified system approved for use by the monolithic surfacing system manufacturer.

2.02 GENERAL

A. Materials shall be designed, manufactured and solely intended for sewer manhole rehabilitation.

1. Materials shall have a proven history of performance in sewer manhole rehabilitation for a minimum of 10 years nationally, of similar age, groundwater levels, and environmental characteristics.

2.03 CEMENTITIOUS LINING

A. Design Mix:

1. Preblended mixture of cements, chemically active aggregates, glass fibers, and other additives. No material, other than water, shall be used with or added to design mix without prior approval or recommendation from the Engineer.
2. One-component, rheoplastic, fiber or polypropylene-reinforced, shrinkage compensated mortar lining system with the following minimum requirements:
    a. Compressive Strength, ASTM C109/C109M: 6,000 psi at 28 days.
    b. Tensile Strength, ASTM C496/C496M: 600 psi at 28 days.
    c. Flexural Strength, ASTM C293/C293M: 1,000 psi at 28 days.
    d. Shrinkage, ASTM C596: 0.02 percent at 28 days.
    e. Minimum Bond, ASTM C952: 200 psi at 28 days.
    f. Slant Shear Bond Strength, ASTM D882: 2,400 psi at 28 days.
    g. Freeze/Thaw, ASTM C666/C666M: Show no visible damage after 100 cycles.
    h. Permeability of the Formulation, ASTM C1202: Less than or equal to 450 coulombs.
    i. Density: 95 pounds per cubic feet minimum.
3. Cementitious material shall be mixed with potable water in accordance with the requirements of the system manufacturer.

B. Application:

1. Spray or spincast application methods shall be executed in accordance with requirements of system manufacturer.
2. Spraying shall be performed by starting at manhole invert and progressing up wall to the chimney.
3. The spincast device used for application is raised and lowered at controlled retrieval speed conducive to centrifugally casting mortar to produce a uniform application to the interior surfaces of the manhole.
4. Cementitious material shall be applied at a uniform minimum thickness as approved in the design submitted in accordance with the contract documents.
5. Cementitious material shall be applied to the bench area in such a manner as to provide for proper drainage.
6. Cementitious material thickness may be verified using a depth gauge. If additional material is required, the rotating applicator head shall be placed at that level and application shall recommence until that area is thickened.
7. Spray and spincast application methods may be used in conjunction to facilitate application of the mortar material to irregularities in the contour of the manhole walls and bench areas.

C. When cementitious lining is used as underlayment for epoxy lining application is used as final rehabilitation lining material, calcium aluminate cement is not required.

D. Manufacturers and Products:

1. Strong-Seal High Performance.
2. Sewpercoat.
3. Flex-Seal.
4. “Or-equal” approved.

2.04 CHEMICAL PRESSURE GROUTING SYSTEM

A. General: Where pressurized injection of chemical grout behind manhole chimney and joints is required, material supplied shall be urethane gel or polyurethane resin with following properties:

1. During injection, chemical sealant shall be able to react/perform in presence of infiltrating water.
2. Cured Sealant:
   a. Capable of withstanding submergence in water without degradation.
   b. Prevent passage of water through manhole defect.
   c. Flexible as opposed to brittle or rigid.
   d. In place, able to withstand freeze/thaw and wet/dry cycles without adversely affecting seal.
   e. Not biodegradable; additives may be used to meet this requirement, if long-term strength is not affected.
   f. Chemically stable and resistant to concentrations of acids, alkalis, and organics found in normal sewage.
3. Mixing of component materials shall be compatible with field conditions.
4. Residual sealing materials shall be easily removable from manhole bench.

B. Urethane Gel:

1. One part urethane prepolymer thoroughly mixed with between five and ten parts water by weight. Recommended mix ratio is one part urethane prepolymer to eight parts of water, 11 percent prepolymer.
2. Liquid Prepolymer:
   a. Solids Content by Weight: 77 percent to 83 percent.
   b. Specific Gravity: 1.04; 8.65 pounds per gallon.
   c. Flash Point: 200 degrees F.

d. Viscosity:
   1) 600 to 1,200 centipoise at 70 degrees F; capable of pumping through 500 feet of 1/2-inch hose with a 1,000 psi head at 1 ounce per second flow rate.
   2) A relative rapid viscosity increase of prepolymer/water mix. Viscosity increases from about 10 to 60 centipoise in the first minute for 1 to 8 prepolymer/water ratio at 50 degrees F.

3. Water: pH range of 6.5 to 8.0.
4. Cure Time:
   a. 80 seconds at 40 degrees F, 55 seconds at 60 degrees F, and 30 seconds at 80 degrees F, when one part prepolymer is reacted with eight parts of water.
   b. May be reduced to 10 seconds for water temperatures of 40 degrees F to 80 degrees F when one part prepolymer is reacted with eight parts water containing gel control agent.
   c. Produce chemically stable, nonbiodegradable, tough, flexible gel.
5. Ability to increase mix viscosity, density, gel strength and resistance to shrinkage by using additives in water component of grout.
6. Ability to accept suspended additives such as 2, 6-dichlorobenzonitrile root control.
7. Contain minimum of 15 percent shrink control agent and supplied by same manufacturer.
8. Manufacturers and Products:
   a. Prime Resins; Prime-Flex 900 XLV or 920.
   b. Avanti International; AV-350 multi-grout or AV-254 urethane gel.

C. Polyurethane Resin Grout:

1. Viscosity: 120 centipoise to 350 centipoise.
2. Weight Per Gallon: 8.65 pounds to 9.48 pounds per gallon.
3. Solids Content, ASTM D2834: 88 percent to 100 percent.
4. Induction Time: 3 minutes to 4 minutes.
5. Cure Time: 5 minutes to 6 minutes.
6. Tensile Strength, ASTM D3574: 40 psi to 450 psi.
7. Elongation, ASTM D3574: 3 percent to 350 percent.
8. Shrinkage, ASTM D1042: Less than 2 percent.
9. Initial Linear Shrinkage: 9 percent.
10. Tear Resistance, ASTM D3574: 21 pounds per inch.
11. Density, ASTM D3574: 38 pounds to 119 pounds per cubic foot.
12. No catalyst required; single component product.

2.05 ACCESSORIES

A. Stainless Steel Inserts:

1. Insert Body: Type 304 stainless steel, minimum 18-gauge.
2. Handle:
   a. Factory-installed, 5-foot-long, 3/16-inch plastic coated stainless steel cable retaining tether that passes through a watertight grommet in bottom of dish with high-grade stainless steel adjustable locking device located between bottom of dish and lift loop at top end of tether.
   b. Stainless steel cable terminal and eye.
   c. Attach handle with No. 6 high-grade stainless steel rivet.
3. Gasket: Made of closed-cell neoprene with pressure sensitive adhesive on one side.
4. Gas Relief Valve:
   a. Designed to release at a pressure of 0.5 psi to 1.5 psi.
   b. Material: Nitrile for prevention of corrosion from contact with hydrogen sulfide, diluted sulfuric acid, and other gases associated with wastewater collection systems.
5. Manufacturers and Products:
   a. Inflow Systems, Inc.; InflowShield.
   b. Sealing Systems, Inc.; Stainless Steel Inserts.
   c. Southwestern Packing and Seals, Inc.; Rainstopper.

B. Cementitious Mortar:

1. Consisting of one part portland cement and two parts clean sharp sand.
2. Cement: Type 1 conforming to ASTM C150/C150M.
3. Sand: Conforming to ASTM C144.

C. Patching Material: Quick setting fiber reinforced cementitious material.

D. Hydraulic Cement:

1. Rapid-setting, high-early strength, cementitious product specifically formulated for leak control.
2. Manufacturers and Products:
   a. IPA; Ipanex-R or Octocrete.
   b. Strong Systems, Inc.; Strong-Seal QSR or Rapid Set.

E. Bonding Agent:

1. Chemical bonding agent that bonds new concrete to a clean structurally sound surface.
2. Manufacturer and Product: Larsen Products Company; Weld-Crete.

F. Manhole Frame to Structure Seal:

1. Manufacturers and Products:
   a. Cretex Specialty Products; Internal Manhole Chimney Seal.
   b. Marathon Materials, Inc.; FlexRib Internal Seal.

G. External Seal Wrap: In accordance with Section 33 05 13, Manholes.

H. Manhole Steps are to be removed prior to coating and not reinstalled.

PART 3 EXECUTION

3.01 TEST EQUIPMENT

A. Before construction begins, obtain and be knowledgeable in use of following equipment:

1. U.S. Weather Bureau Psychometric Tables for determining dew point from wet and dry bulb temperatures, as available from KTA-Tator, Inc., Pittsburgh, PA.
2. Portable, self-contained, hand-held sling psychrometer with thermometers ranging from 20 degrees F to 120 degrees F and built-in slide rule for determination of relative humidity as manufactured by Bacharach instrument Co., Pittsburgh, PA; or Taylor Co.
3. Hand-held digital thermometer, range minus 20 degrees F to 200 degrees F, and interchangeable surface temperature and air temperature probes as manufactured by Atkins.
4. High voltage holiday detector for thick film coatings as manufactured by Tinker and Razor, Model AP/W, San Gabriel, CA.
5. Ten hand-held pH pencils suitable for measuring pH of concrete surfaces as manufactured by Burrel Scientific, Model Insta-Check Surface pH pencil, No. P-13N, Pittsburgh, PA.

B. Use for monitoring and testing requirements.

C. Store at Site and maintain in accurate working condition.

D. Available to the Engineer for testing purposes.

3.02 PREPARATION

A. General: All surfaces including benches, joints, lift holes and walls shall be made smooth and suitable for application of the interior surfacing system. All benches and inverts shall be in place and complete. Active flows shall be dammed, plugged or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated. Installation of the protective coating shall not commence until the concrete substrate has properly cured.

1. Notify the Engineer 3 days, minimum, prior to start of surface preparation work or coating application work.
2. Control environment within manhole; this includes maintaining temperature and humidity for linings being applied.
3. Provide illumination for surface preparation, and application and curing of underlayment and lining materials.
4. Provide equipment to ventilate facilities during application and cure of lining materials.
5. Cleaned substrate shall be inspected and approved by the Engineer and manufacturer’s representative prior to application of underlayment or lining materials.
6. Remove loose and broken brick, mortar, concrete or debris, and pipe from manhole.
7. Prevent construction materials from entering sewer pipelines.
8. Replace structurally unsound manholes as directed by the Engineer.

B. Bypass Pumping: In accordance with Section 01 57 28, Temporary Flow Control.

C. Surface Preparation: Applicator shall inspect all surfaces specified to receive the monolithic surfacing system prior to surface preparation. Applicator shall notify the Owner of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the monolithic surfacing system. All concrete that is not sound or has been damaged by chemical exposure shall be restored to a sound concrete surface. All contaminants including: all oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. Surface preparation method(s) shall be based upon the conditions of the substrate and the requirements of the monolithic surfacing system to be applied. Surfaces to receive protective coating shall be cleaned to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the monolithic surfacing system and the substrate. The first procedure upon entering each structure will be to blast all specified surfaces by low pressure water cleaning.

1. Perform surface preparation in presence of the Engineer, unless the Engineer agrees Work may be performed in the Engineer’s absence.
2. Inspect and provide substrate surfaces prepared in accordance with these specifications, and printed directions and recommendations of manufacturer.
3. Place bench covers over invert before prepping manhole.
4. Prevent concrete debris, generated during surface preparation, from interfering with the Owner’s treatment process or equipment.
5. Remove roots, dust, loose particles, oils, grease, chemical contaminants, attacked concrete, and previously applied protective coatings.
6. Access Steps: Prior to lining installation, remove access steps, if present, by cutting steps flush with wall.
7. Cleaning:
    a. Remove loose and protruding brick, mortar, and concrete using mason’s hammer, chisel, and scraper.
    b. Mark and protect embedded anchors prior to blasting.
    c. Remove foreign materials from manhole walls and bench using high-pressure water spray, minimum 3,500 psi.
    d. Hydroblasting:
        1) Nozzle Pressure: 10,000 psi, minimum.
        2) Use potable water.
    e. Abrasive Blasting:
        1) Nozzle Pressure: 100 psi, minimum.
        2) Use nonsilica abrasives.
    f. Keep material from falling into sewer during cleaning.

8. Surface pH:
    a. Regularly, approximately every 100 square feet, measure surface pH using pH test pencils to verify compliance with specification.
    b. Surfaces not meeting requirements shall be marked and reblasted.
    c. Concrete Surface: 10 pH, minimum.

D. Defects: Following completion of surface preparation, plug hydrostatic leaks with waterstop material. Fill and stop voids and active leaks prior lining application.

E. Notify the Engineer if reinforcing steel is exposed during surface preparation operation.

1. Repair reinforcing steel per the Engineer’s instructions.
2. Exposed rebar shall be abrasive blasted, SSPC SP10, and coated with at least 3 mils of epoxy.

F. Bench Construction and Invert Repair:

1. Bench: Construct using quick setting grout or repair mortar per manufacturer’s recommendations.
2. Invert Repair:
    a. Perform on inverts with visible damage or where infiltration is present.
    b. After blocking flow through manhole and cleaning invert, apply quick setting patch material.
    c. Finished invert surface shall have a smooth surface and form a continuous monolithic conduit with sewer pipe entering and leaving manhole.
3. Form watertight seal with manhole walls, base, and pipe seal.
4. Prevent wastewater contact with new bench and invert for 6 hours to 8 hours after mortar placement. If 6 hours to 8 hours set time is not possible, use fast-setting, high early strength mortar until concrete has set.

3.03 LINING APPLICATION

A. General:

Application procedures shall conform to the recommendations of the interior surfacing system manufacturer, including material handling, mixing, and environmental controls during application, safety, and equipment. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order. The specified materials must be applied by an approved installer of the monolithic surfacing system. The walls and bench of the manhole shall be lined with the monolithic surfacing system to provide a thickness as previously specified based on the condition of the existing structure and in accordance with manufacturer’s recommendations. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in accordance with the recommendations of the monolithic surfacing system manufacturer.

1. The Engineer will inspect cleaned substrate before application of lining; provide 24-hour notification.
2. Follow lining manufacturer’s recommendations to ensure installation of minimum thickness and pinhole free surface.
3. Do not apply lining until new concrete manhole has reached its 28-day strength, unless otherwise approved by the Engineer.

B. Cementitious Lining:

1. The work consists of troweling, spray applying and/or spincasting cementitious materials to the inside of the existing manhole.
2. Flow shall be controlled or removed from application surfaces until the cementitious system is set and cured in accordance with the requirements of the material manufacturer.
3. Surfaces shall be prepared in accordance with the requirements of the system manufacturer. Material shall be applied only when manhole is in a damp to wet or saturated surface dry (SSD) state, or in accordance with the requirements by the system manufacturer.
4. Active infiltration shall be stopped prior to application of the cementitious system.
5. Cementitious material shall not be applied during freezing weather conditions where the ambient temperature is 37°F (3°C) and falling, or when the temperature is anticipated to fall below 32°F (0°C) within the ensuing 24 hours.
6. Application of cementitious systems shall be in accordance with requirements of system manufacturer and ASTM F2551.

7. Manhole steps shall be removed flush to manhole surface prior to installation of cementitious system unless otherwise specified in contract documents.
8. Preparation:
    a. Clean and scarify with minimum of 5,000 psi water jet at a minimum water temperature of 180 degrees F.
    b. Substrate pH: 8.3 minimum.
    c. Water jet shall hit manhole wall surface at as near perpendicular angle as possible.
    d. Cleaning manhole walls from ground surface without appropriate angled nozzles will not be accepted.
    e. Additional aggressive surface preparation and cleaning methods may be necessary to remove carbonated cementitious lining concrete or contaminants that remain after cleaning performed as described above.
        1) Test pH of cleaned manhole interior surface at various locations.
        2) When results indicate a pH less than 8.3, then additional surface preparations and cleaning will be required.
        3) As a minimum level of effort, perform dry sand blasting or pneumatic jackhammering with bushing bit followed by a minimum 5,000 psi water blast.
9. Bonding Agent: Apply to existing surface to provide firm adhesion between original and new cementitious materials in accordance with manufacturer's recommendation.
10. Spray apply or centrifugally cast on to fresh mortar before new bacterial growth can contaminate underlying mortar.
11. Thickness:
    a. Apply cementitious lining material; material shall start at bottom of manhole frame and extend to water level of invert.
    b. Minimum one-half inch thickness. Installation shall be in accordance with the manufacturer's recommendations and Macon Water Authority criteria.
12. Working time of material after initial application shall be approximately 30 minutes.
13. Finish repair material to a hard trowel finish and then finish with a sponge float. Sponge float finish shall have a surface profile of 8 mils to 10 mils.
14. If cementitious lining material is not immediately coated with epoxy, apply seal coat compatible with repair material to aid in curing and minimize recontamination of substrate prior to application of epoxy lining material.

15. Testing and Acceptance
    a. Perform visual inspection to verify there is no infiltration and surface appears uniform, free of cracks or loose material.
    b. Perform vacuum test to verify integrity of fully rehabilitated manholes in accordance with ASTM C1244.
    c. Obtain cube or cylinder samples of cementitious repair mortar from each mix or batch of material, as required by the Owner. Samples shipped by the Contractor sent Owner through chain of custody independent laboratory testing compressive strength at 28 days accordance ASTM C39 ASTM C109.
16. Obtain full cure of system before area is placed back in service. Consult manufacturer’s written instructions for requirements. Do not immerse lining or coating until completion of curing cycle.
17. Epoxy Lining:
    a. Apply 100 percent epoxy lining where corrosion is anticipated. Apply over completed cementitious lining material (without calcium aluminate).
    b. Remove curing compounds, sealers, or other contaminates prior to epoxy lining.
    c. Repair structural defects, voids, or cracks in substrate prior to application of underlayment or lining. Repair materials shall be approved by lining manufacturer.
    d. Apply epoxy lining material in accordance with manufacturer’s recommendations over waterproofing/structural repair material. Apply in multiple layers as required to prevent material sag or run.
    e. Resurface attacked or rough concrete substrate, including voids, crevices, and holes, with underlayment material to return it to pre-existing levels. Mix and apply underlayment in accordance with lining manufacturer’s written recommendations.

C. Chemical Pressure Grouting:

1. General:
    a. No grouting operations shall be performed at temperatures below manufacturer’s recommendations or where temperature of groundwater is below manufacturer’s recommendations.
    b. No application of repairing, sealing, or lining material shall be made when ambient temperatures are less than manufacturer’s recommendations and when freezing is expected within 24 hours, unless specific recommendations are made by manufacturer. If ambient temperatures are in excess of 90 degrees F, take precautions to keep mixing water below 85 degrees F; use ice if necessary.

c. Use urethane gel grout or polyurethane resin grout for manhole as designated on the Drawings.
d. Perform pressure grouting on sections that have evidence of rain-derived inflow and infiltration.
e. Pressure chemical grouting of manhole shall include chimney and pipe seals.

2. Preparation:
   a. Perform grade adjustments, frame and cover replacements, chimney repairs, frame seals, and other repairs prior to pressure grouting.
   b. Perform pressure grouting prior to interior lining.
3. Manhole Wall Preparation:
   a. Place bench covers over invert before prepping manhole. Prevent construction materials from entering sewer pipelines.
   b. Clean and abrade surfaces to produce a sound concrete/brick surface with adequate profile and porosity to provide strong bond between protective coating and substrate. Remove foreign materials from manhole walls and bench using high-pressure water spray.
   c. Remove loose and protruding brick, mortar, and concrete using mason’s hammer and chisel or scraper.
   d. Remove existing roots by cutting them flush with manhole wall.
   e. Remove contaminates, including but not limited to oils, grease, waxes, form release, curing compounds, efflorescence, sealers, salts, and incompatible existing coatings.
   f. Fill and stop voids and active leaks prior to coating or lining application.
   g. After preparation has been completed, remove loose material from manhole.
4. Pipe Sealing:
   a. Remove deteriorated area of pipe seal to sound material.
   b. Drill injection holes with a minimum of three holes around pipe wall connection.
   c. After removal of grouting probe, use activated oakum rope to fill injection hole.
   d. Patch injection hole with waterproof, quick setting mortar and cover with moisture resistant two-part epoxy adhesive coating.
   e. Prevent wastewater contact with new pipe seal after quick-set grout placement.
   f. Pipe seal shall form watertight seal with manhole wall, bench, trough, and pipe.

D. Internal Manhole Chimney Sealant:

1. Perform repair work prior to applying internal manhole chimney sealant.
2. Clean contaminates from manhole frame by sandblasting or mechanical methods as recommended by chimney sealant manufacturer.
3. Install internal manhole chimney sealant in accordance with manufacturer’s recommendations.
4. Contact manufacturer for thickness recommendations; however final lining material shall be 170 mils minimum.

3.04 APPLICATION

A. Internal: The adjustment ring area under the casting shall receive a thickened flexible urethane to achieve a minimum thickness of 120 mils. The mil thickness is directly related to the expansion associated within the territories climate. The liner shall be applied by spray, brush, or trowel three inches above the bottom of the frame, and shall cover the entire adjustment ring area to three inches below the bottom adjustment ring.

B. External: The adjustment ring area under the casting shall receive a thickened flexible urethane to achieve a minimum thickness of 120 mils. The mil thickness is directly related to the expansion associated within the territories climate. The liner shall be applied by spray, brush, or trowel two inches wide over the flange of the frame, and shall cover the entire adjustment ring areas to three inches below the bottom adjustment ring.

C. Preparation:

1. Place covers over invert before prepping.
2. All foreign materials shall be removed from the manhole walls and bench using high pressure water supply (minimum 1200 psi). Loose and protruding brick, mortar and concrete shall be removed using a mason hammer, chisel, and/or scrapers. Remove all the existing manhole steps. Fill any voids at least one hour prior to spray application of the first coat.
3. Active leaks shall be stopped using products specifically for that purpose and according to manufacturer’s recommendations. Some leaks may require grouting to stop the inflow. Apply according to Strong Systems or equivalent manufacturer’s grouting instructions.
4. After all preparation has been completed remove all loose material.
5. The ring adjustment area and the lower three inches on the casting frame and the top 3 inches of the cone/slab must be prepared according to the manufacturer’s instructions.
6. All preparation methods shall be in accordance with manufacturer’s instructions.

D. Mixing: Any product used will be mixed according to manufacturer's instructions.

1. Caution: Do Not Over Mix And Do Not Run Pump Empty.
2. Re-mixing or tempering will not be permitted. Rebound materials shall not be reused.

E. Spraying: Any product used will be sprayed according to manufacturer's instructions.

3.05 ACCESSORIES

A. Stainless Steel Insert:

1. If existing manhole is equipped with nonstainless steel insert, remove and dispose of existing insert.
   a. Install new stainless steel insert in accordance with manufacturer's recommendations.
   b. Install rivet used for attaching insert to manhole into casting.
2. If existing manhole is equipped with stainless steel insert pan, clean pan and reinstall unless determined to be defective by the Engineer.
   a. If insert is determined to be defective, install new stainless steel insert in accordance with manufacturer's recommendations at completion of manhole rehabilitation operations.

B. Patching Material Application:

1. Mix and apply according to manufacturer's recommendations.
2. Apply rapid-set grout to area. Grout shall be consolidated, fill existing voids, and create a smooth, dense surface.

C. Frame to Structure Seal:

1. Install in accordance with details of Contract Documents and manufacturer's recommendations.
2. Seal shall extend from side of manhole frame down to cone or corbel of manhole.

D. External Seal Wrap:

1. When work consists of adjusting manhole or cone replacements, install external seal wrap to outside of concrete risers, steel risers, and joints of precast manhole to eliminate infiltration.
2. Install in accordance with details of Contract Documents and manufacturer's recommendations.

E. Manhole Steps: Install in accordance with manufacturer’s instructions.

3.06 TESTING

A. General:

1. Perform testing at locations designated by the Engineer and documented to satisfaction of the Engineer.

B. Air, Concrete Substrate, and Lining Materials:

1. Temperatures:
   a. Measure and record twice daily air, concrete substrate, and lining surface temperatures within structure during mixing, application, and curing of materials; verify compliance with manufacturer’s temperature ranges.
   b. Take measurements in morning and afternoon in presence of the Engineer.
   c. If outside acceptable range, make adjustments to return to and maintain manufacturer’s required temperatures prior to continuing lining application.
2. Humidity:
   a. Measure and record twice daily relative humidity within structure during mixing, application, and curing of materials; verify compliance with manufacturer's requirements.
   b. Take measurements in morning and afternoon in presence of the Engineer.
   c. If outside acceptable range, make adjustments to return to and maintain manufacturer’s required relative humidity prior to continuing lining application.

C. Cementitious Lining: Take a minimum of two 3-inch diameter by 6-inch tall cylinders of coating material from each day’s work with date, location, and job recorded on each. Cylinders shall be sent to a certified testing laboratory for twenty-eight day compression testing. Compression test shall be conducted per ASTM C780, and results shall be furnished to the Engineer and the Owner on request.

D. Chemical Pressure Grouting: Take a minimum of two test coupons from each day’s work with date, location, and job recorded on each. Send coupons to certified concrete testing laboratory, where testing shall be conducted and recorded in accordance with manufacturers recommendations.

E. Infiltration and Inflow Testing:

1. Test rehabilitated manholes for sources of infiltration in presence of the Engineer.
2. Conduct testing during high groundwater conditions, wherever possible.
3. Manholes that are observed to be leaking by the Engineer during periods of high groundwater or during inflow conditions shall be subject to additional repairs.
4. Test manholes in accordance with ASTM C497 or ASTM C924.
5. Perform additional rehabilitation work and retest.
6. Dye Water Test:
    a. Test rehabilitated manholes and new manholes, unless manhole has successfully passed vacuum test in accordance with Section 33 05 13, Manholes.
    b. Consist of applying concentrated dye solution around manhole frame.
    c. Apply dyed water for 10 minutes minimum.
    d. Manholes observed to be actively leaking greater than one drip per 5 seconds will have failed test and will not be acceptable.
    e. Perform additional rehabilitation work and retest.

F. Water Tightness: Prior to testing manholes for water-tightness all lift holes shall be plugged with a non-shrink grout, all joints between pre-cast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass the following test.

1. Vacuum Test: The manhole, after proper restoration as noted above, shall be vacuum tested. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the port with the valve open. A vacuum of 5 inches of Mercury shall be drawn in the manhole and the time measured for the vacuum to decay four inches. The manhole shall pass the test if the time is greater than 60 seconds for 48 inch diameter manholes, If the manhole fails the initial test, necessary repairs shall be made. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc., or approved equivalent.
2. Flex-Seal Utility Sealant Test: American Society for Testing and Materials (ASTM) annual book of Standards.
    a. ASTM D412 Test Method for Tensile Properties and Elongation.
    b. ASTM D903 Test Method for Adhesive Strength.
    c. ASTM C1244-93 Vacuum Test 10 inches for 2 minutes.

END OF SECTION