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Addendum No. 1

for

Midtown Sanitary Sewer Improvements

For City of Mt. Vernon
Jefferson County, Illinois

H&A File No. 40039-503
March 4, 2022

The Contract Documents prepared by Heneghan & Associates, P.C for the Midtown Sanitary Sewer Improvements for the City of Mt. Vernon, Illinois, are hereby amended or clarified as follows:

GENERAL

Attached, find the Pre-Bid meeting Minutes and attendance sheet from the Pre-Bid meeting held February 22, 2022, 10:00 am at City Hall in Mt. Vernon, Illinois. The Minutes are made a part of this Addendum, and the items stated in the Minutes shall be followed.

PROJECT SPECIFICATIONS

Changes/additions/clarifications to the project specifications are as listed below:

1. N/A

PROJECT DRAWINGS

Changes/additions/clarifications to the project drawings are as listed below:

1. Section 124 Manhole Restoration shall be replaced in its entirety with the attached section. Changes are identified by **highlight**.

End of Addendum.

Lindsey L. Bowlin, P.E.
Project Manager

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Included below are the meeting minutes for the pre-bid meeting referenced. Items in *italics* are items discussed during the meeting, previously not represented on the agenda. Additionally, a copy of the sign-in sheet is attached for reference.

City of Mt. Vernon
2020 IEPA Funded Sanitary Sewer Improvements
and Midtown Sanitary Sewer Improvements
Pre-Bid Meeting ~~Agenda~~ *Minutes*
Tuesday, February 22, 2022 10:00 A.M.
City of Mt. Vernon, 1100 Main Street, Mt. Vernon, IL, 62864

1. Introduce
   A. Heneghan & Associates' Representatives - *Lindsey Bowlin and Tyler Meyer*
   B. City of Mt. Vernon Representatives – *Brad Ruble*
   C. Contractors introduced by name and company.
2. Please sign the Attendance Sheet.
3. Bid Opening **Thursday, March 24, 2022 @ 10:00 am**, City of Mt. Vernon, 1100 Main Street, Mt. Vernon, IL, 62864.
   a. 5% Bid Bond.
   b. Must use Davis Bacon Wage Rates listed in the specifications.
   c. Hold bid prices for 90 days.
   d. Engineer's estimate for is: *2020 Sewer Project under $3,000,000*
   Midtown Sewer Project under $1,000,000
4. If the Bids are acceptable, a recommendation will be given to the City of Mt. Vernon. IEPA concurrence on the Award would be expected within 60-90 days, at which time the CONTRACTOR would be sent a Notice of Intent to Award (WPCLP 28). The CONTRACTOR will then have two weeks to execute the necessary paperwork and bonding requirements. Based on the schedule above, the completion date will be as noted in the contract documents:
   a. 2020 IEPA Funded Project – Substantial Complete: April 30, 2023; Final June 30, 2023
   b. Midtown Project – Substantial Complete: April 30, 2023; Final June 30, 2023
5. Submit pay request(s) two Fridays before the First or Third Monday of each month for the City's Council meetings, to City. After the City of Mt. Vernon approves, pay request submitted to IEPA. Once approved at IEPA typically less than or equal to 30 days, pay request paid by the City of Mt. Vernon (within 30 days).
6. Planholder's lists available upon request and online at haengr.com.
7. Changes/Clarifications to the Plans and Specifications currently include the following:
   a. Plans:
      i. *2020 Sewer Project - None to date*
      ii. *Midtown Sewer Project - None to date*
   b. Specs:
      i. *2020 Sewer Project - None to date*
      ii. *Midtown Sewer Project - None to date*

8. Comments from HA:
    a. Construction MUST start prior to June 31, 2022, *requirements per IEPA funding*
    b. Retainage – 10%; stored material 10%, *per EJCDC in spec book*
    c. Liquidated Damages – $800 per calendar day or actual damages, whichever is greater
    d. Prevailing Wages – Davis Bacon
    e. American Iron and Steel Act requirements apply, *City typically handles submittals*
    f. DBE Subcontractor Rules – WPCLP 53-57, *note advertisement for DBE must run at least 16 days prior to bid opening*
    g. Shop Drawing (Submittal) Review – Contractor shall review prior to submittal to Engineer; shall contain contractor's signature and date of review on transmittal. Contractor shall provide written notice of deviations of any type from the requirements of the contract documents. Sample of Engineer response shall be provided with minutes from this meeting.
    h. On-site Observation by City, *Heneghan observation as requested by City*
    i. Review Construction Scopes - *The 2020 project consists or large diameter sanitary sewer rehab, 8" and 18" force main, and 3 railroad crossings. The Midtown project consists of 8" and 12" CIPP lining as well as 8" and 15" sanitary sewer replacement. Generally, 2020 project deals with larger diameter sanitary sewer and Midtown deals with smaller diameter.*

Pipe "Rebab" includes cleaning, televising and CIPP lining where suitable and pipe replacement in locations unable to be lined.

Each railroad crossing will have their own specific requirements outlined in the spec book. We are currently waiting on the Norfolk Southern permit (they are reviewing the City insurance) and will issue that permit via addendum when received.

Potential coordination with the 2020 and Midtown contractors may be required.

The meeting minutes will be issued via addendum.

9. Comments from the City of Mt. Vernon representatives:

Brad mentioned the City has had a hard time meeting the requirements of the Illinois Works Apprenticeship Initiative (10% apprenticeship goal) and would prefer the Contractor be able to comply with this requirement.

15. Comments/Questions from Contractor's:

Haier asked what the Contractor's requirement will be for costs associated with railroad crossings? In general, paying for railroad insurance will be the responsibly of the Contractor and the flagging fees will be billed directly to the City.

Haier asked who is responsible for survey layout at railroad crossings? Brad said Contractor but that cost can be passed on to the City.

Haier asked about the City paying for any material price increases? Brad said the City could possibly be open to paying that depending on the situation.

16. Site Visit - *No site visit was taken*

Meeting ended at 10:25 A.M.

City of Mt. Vernon

2020 IEPA Funded Sanitary Sewer Improvements and Midtown Sanitary Sewer Improvements

Pre-Bid Meeting – Tuesday, February 22, 2022 10:00 A.M.

City of Mt. Vernon, 1100 Main Street, Mt. Vernon, IL, 62864

Attendance List

Name	Company	Title
LINDSEY BOWLIN	Heneghan and Associates, P.C.	Project Manager
Tyler Meyer	Heneghan and Associates, P.C.	Project Engineer
Matt Trotter	J.K. Trotter	VP
Logan Otis	Sherwin-Williams	Representative
Brad Rubb	City of Mt. Vernon	City Engineer
Jim Rossel	Hafer P & H	Pres.

Manhole Rehabilitation

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Section 124

PART 1 - GENERAL

A. These Specifications include the minimum requirements for the rehabilitation of manholes as shown on the plans included as part of these Contract Documents.

B. The rehabilitation of manholes shall be accomplished by the application or installation of rehabilitation components either individually or together. These may include grouts, protective coatings, a variety of linings, inserts, seals and mechanical devices that, when installed, shall protect the manhole structure, seal it from I & I, rebuild it structurally (if needed) and provide chemical resistance for the length of time specified. Several manhole components such as frames, covers and steps will typically be replaced rather than rehabilitated. The Contractor is responsible for the accurate and complete installation, and warranty of each manhole Rehabilitation Component System (SYSTEM) specified by the Owner.

C. The manhole SYSTEM's installed shall cause no adverse effects to any of the Owner's processes or facilities either during or after application. The use of the product, by the Contractor, shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the Owner and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the manhole SYSTEM's installed and determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.

D. The prices submitted by the Contractor, shall include all costs of permits, labor, equipment and materials for the various bid items necessary for furnishing and applying, complete in place, manhole SYSTEM's, in accordance with these specifications. All items of work not specifically mentioned herein which are required to make the product perform as intended and deliver the final product as specified herein shall be in the bid prices. These Specifications include the minimum requirements for the rehabilitation of manholes defined herein and as shown on the plans included as part of these contract documents.

1.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY

A. These Specifications cover all work necessary to furnish and install, a variety of protective manhole SYSTEM's. The Contractor shall deliver a finished product(s) including all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage flows, cleaning equipment, product installation, all quality controls and samples for performance of required material tests, final inspection and warranty work, all as specified in these contract documents and at the quantities of each component contained in the Bid Proposal.

B. The SYSTEM's furnished shall be complete integrated and compatible systems including all materials, manufacturer's recommended equipment and manufacturer's installation procedures. The SYSTEM manufacturer may submit to the Owner, a minimum of 14 calendar days in advance of a bid date, all required product information to obtain pre-approval SYSTEM status. Those SYSTEM's that have been pre-approved will not need to be re-submitted as required in the submittal section of these specifications unless any of

the system components have changed from those preapproved by the Owner. All other component products will be required to meet the submittal requirements as contained herein.

C. The SYSTEM's installed shall be free of all defects that will affect the design and service life and operation of the manhole.

D. The SYSTEM installed shall eliminate water leakage into the manhole and prevent water or vapors to leak out of the manhole through pin-holes or other defects. If leakage occurs either in or out of the manhole the Contractor shall seal these areas to stop all leakage using a material compatible with the SYSTEM applied and as specified by the manufacturer. If leakage occurs through any SYSTEM applied to the manhole, the SYSTEM shall be repaired or removed as recommended by the manufacturer. All repair materials shall have the same estimated life expectancy than the SYSTEM installed. Final approval of the SYSTEM installation will be based on meeting the acceptance test requirements for each SYSTEM applied/installed.

E. The SYSTEM (applied to the intended structure) shall be designed against corrosion and typical chemicals found in domestic sewage, unless otherwise specified in the detailed section of the contract documents. The manufacturer of the SYSTEM shall provide testing data that supports their SYSTEM's design and service life.

F. SYSTEM'S may be designed to rehabilitate the existing manhole against corrosion, I&I structural build-back, or a combination of the three. In certain cases, the preparation, certification and submission of design calculations by a registered professional engineer is required for manhole replacement and rehabilitation technologies. All design must be supported by third party testing and documentation for the exact product that is being submitted.
   1. A manhole is specified to be structurally replaced, being able to sustain all earth, hydrostatic and dynamic loading without support by the existing structure. Certification and submission of design calculations by a registered professional engineer is required.
   2. A manhole is specified to be structurally rebuilt, with build-back materials, or rehabilitated to sustain hydrostatic loading by groundwater. Certification and submission of design calculations by a registered professional engineer is required
   3. A manhole is specified to receive a corrosion protective coating sufficiently thick to totally protect the existing host structure from further corrosion, deterioration and water vapor transmission. Certification and submission of design calculations by a registered engineer may be required.
   4. A manhole is specified to receive a coating to renew mortar or other deteriorated components of a manhole but has no specified longevity or corrosion resistance requirement. The manufacturer's third party testing will be acceptable for application suitability.
   5. A manhole is specified to receive patch repair materials for portions of the manhole. The manufacture's third party testing will be acceptable for application suitability.

G. All manhole steps shall be removed prior to a coating or lining application.

H. Flow from existing active service connections entering the manhole shall be maintained or bypassed if the flow will affect proper SYSTEM application/installation.

I. All component materials furnished, as part of this contract shall be marked with detailed product information, stored in a manner specified by the manufacturer and tested to the requirements of this contract.

J. Testing shall be executed by the owner or by the contractor in the presence of the owner. Warranty inspections shall be executed by the Owner or its representative. Any defects found shall be repaired or replaced by the Contractor.

K. The Contractor shall furnish all samples for product testing as required in the contract documents. The Owner shall take possession of the samples for testing and shall maintain a chain of custody, deliver the samples and pay an approved laboratory for all material and product testing performed under this contract.

L. Compensation for all work required for providing test samples shall be included in the various SYSTEM items contained in the Bid Proposal.

1.2 SUBMITTALS

A. Product data submittals required for all rehabilitation SYSTEM's proposed for installation under this contract shall include:
   1. SYSTEM material type and manufacturer to be used including: catalog data sheets, ASTM references, material composition, manufacturers recommended specifications, component physical properties and chemical resistance. (PWS)
   2. Manufacturer's detailed description of the recommended procedures for handling and storing materials including a proposed method for monitoring temperatures of the storage location, if applicable to the specific SYSTEM material. (PWS)
   3. Manufacturers detailed description of the recommended material installation/application process including mixing, additives, set time, cure time (return to service) and all equipment required for quality product delivery. (PWS)
   4. Manufacturer's detailed description of all required field testing processes and procedures. (PWS)

1.3 SYSTEM REPAIR/REPLACEMENT

A. Due to mechanical damage or defects in application, SYSTEM's will occasionally need to be repaired or replace a portion of the installed product. The Manufacturer shall outline specific repair or replacement procedures for potential issues that may occur during the application of the SYSTEM. Repair/replacement procedures shall be as recommended by the SYSTEM Manufacturer and shall be submitted as part of the PWS.

B. The Contractor shall receive no additional compensation for the repair or replacement of SYSTEM's deemed non-conforming to the requirements of these contract documents and unacceptable by the Owner.

1.4 DELIVERY, STORAGE AND HANDLING

A. Rehabilitation component materials are to be kept dry, protected from weather and stored under cover and in accordance with manufacturer's recommendations.

B. Polymer and Cementitious protective coating materials are to be stored at temperatures as recommended by the manufacturer and handled according to their material safety data sheets. Do not store near flame, heat or strong oxidants.

1.5 SAFETY

A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.

B. The Contractor shall perform all of the Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for manhole rehabilitation components. Confined space, defined as any space having one or more of the following characteristics:
   1. Limited openings for entry and exit.
   2. Unfavorable natural ventilation.
   3. Not designed for continuous worker occupancy.

1.6 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the SYSTEM to be free from defects in raw materials for one (1) year after installation or from the date of acceptance by the Owner, whichever is later. The Contractor shall warrant the installation of the rehabilitation component for a period of one (1) year. During the one (1) year warranty period if the rehabilitation component, fails, delaminates, peels or shows any defect, which may materially affect the integrity, strength, function and/or operation of the manhole structure, it shall be immediately repaired at the Contractor’s expense in accordance with procedures included in Section 1.3 System Repair/Replacement.

B. After a manhole has been renewed and for a period of time up to one (1) year following completion and final acceptance of the project, the Owner may inspect all or portions of the renewed manholes. The specific locations will be selected at random by the Owner and will include all types of structures from this project.

C. If any of the rehabilitation components have developed defects since the time of "Quality Assurance and Testing," the defects shall be repaired and/or the component shall be replaced as defined in Section 1.3 System Repair/Replacement. Owner may inspect all manholes where SYSTEM’s have been applied/installed under this contract.

D. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.3 System Repair/Replacement and per the original specifications, all at no additional cost to the Owner.

1.7 WARRANTY INSPECTIONS

A. Visual inspection to determine integrity of SYSTEM materials and water-tightness will be conducted within 30 days before the expiration of the guarantee period.

B. If possible, inspection should be performed in the spring during high groundwater and frequent rainfall events.

C. The Owner shall perform, at its own cost, warranty inspections with its own personnel or personnel independent of the installation contractor.

D. No infiltration or inflow shall be visible in the renewed manhole.

1.8 MEASUREMENT AND PAYMENT

A. Measurements for each item furnished and installed to the satisfaction of the Owner shall be at the units of measure contained in the Bid Proposal. Manhole coatings and linings will be measured over the entire installed length. Coating and/or lining of the channel shall be at the Lump Sum price per each bid therefore in the Proposal.

B. Payment for each SYSTEM furnished and installed, in accordance with the contract documents and to the satisfaction of the Owner, will be at the unit or lump sum prices bid therefore in the Bid Proposal.

PART 2 - REHABILITATION COMPONENT SYSTEM PRODUCTS

A. The SYSTEM'S defined herein include those identified as commercially accepted methods for manhole rehabilitation. Methods or products not defined herein must be pre-approved by the Owner before use on this project under these specifications.

2.1 CEMENTITIOUS MANHOLE RESTORATION **& EPOXY TOPCOAT**

A. REFERENCES

ASTM F2551 Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes

ASTM C150 Standard Specification for Portland Cement Type I

ASTM C33-86 Standard Specification for Concrete Aggregates

ASTM C78 Standard Test Method for Flexural Strength of Concrete; Using Simple Beam with Third Point Loading

ASTM C109/C109M-05 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

ASTM C157/C157M-06 Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

ASTM C267 Test Methods for Chemical Resistance of Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

ASTM C293-02 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)

ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C321-00(2005) Standard Test Method for Bond Strength of Chemical-Resistant Mortars

ASTM C348-02 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

ASTM C494-86 Standard Specification for Chemical Admixtures for Concrete ASTM C496/C496M-04e1 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

ASTM C666/C666M-03 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

ASTM C882-05 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear

ASTM D543 - Resistance of Plastics to Chemical Reagents.

ASTM D638 - Tensile Properties of Plastics.

ASTM D695 - Compressive Properties of Rigid Plastics.

ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abrader

ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages

ASTM D7234 - Pull-off Strength of Coatings Using a Portable Adhesion Tester. SSPC SP-13/NACE No. 6 – Surface Preparation of Concrete

NACE SP0188 - For performing holiday detection

CIGMAT - Evaluation of Liner System for Wastewater Concrete and Clay Brick Facilities

ASTM G210 - Severe Wastewater Analysis Test

B. GENERAL
1. The Contractor shall provide a cementitious restoration material designed for structural build-back, I&I abatement, corrosion resistance, and repairing inverts to design requirements **followed by an epoxy topcoat**. All materials applied to a structure shall be compatible, as specified by the manufacturer.

C. MANHOLE REPAIR MATERIALS
1. Infiltration Control – Cementitious Material
   a. All fast setting materials furnished shall be designed specifically for leak control, to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in manholes or related structures, in accordance with the manufacturer's recommendations.
2. Infiltration Control - Oakum Water Plugs
   a. Rapid setting, oil free oakum and hydrophilic grout to seal active water leaks prior to applying other SYSTEM's
   b. Oil-free oakum meeting Federal Specification HH-P-117
   c. Two-part urethane resin.
3. Invert Repair and Patching
   a. All material furnished, by the Contractor, shall be designed to fill large voids in manhole walls and to repair or reconstruct inverts where no hydrostatic pressure exists. Material shall consist of rapid setting cements, monocrystalline quartz aggregates, and various accelerating agents. Material shall not contain chlorides or metallic particles and shall be applied in accordance with the manufacturer's recommendations.

b. Repair and Patching Materials shall have its bond strength tested to substrate failure according to ASTM C952 and be compatible with all other material components applied to the manhole.

4. Grouting mix:
   a. For stopping severe infiltration, the Contractor shall provide a polymer solution that reacts freely with water to form a strong film, gel, or foam of polyurethane, conforming with the Standards of NASSCO manhole rehabilitation.
5. Cementitious Coating Restoration Materials for manhole walls, channels, corbels, chimneys, and benches. The Contractor shall install cementitious restoration materials that shall be specifically designed for the rehabilitation of manholes and other related wastewater structures. Liner materials shall be cement based, poly fiber reinforced, shrinkage compensated, and enhanced with chemical admixtures and siliceous aggregates. Liner materials shall be mixed with water per manufacturer's written specifications and applied using equipment specifically designed for, troweling, low-pressure spray or centrifugal spin casting application. All cementitious liners shall be troweled to densify and smooth out the surfaces.
6. Cementitious coatings shall be applied to a wet surface to ensure proper bonding between original manhole material and cementitious coating.

D. **EPOXY TOPCOAT**

1. Epoxy Coating products must be compatible with the structure cementitious rehabilitation system. Substrate and surface preparation, application conditions, application equipment, material preparation, and curing shall be in strict accordance with the manufacturer's written recommendations.

2. Epoxy Coating Products:

a. Shall be a monolithic, 100% solids, solvent-free epoxy lining with corrosion resistant, rapid curing epoxy resin that will cure at low temperatures and in the presence of water. This material shall have the following minimum properties:

Characteristic	Minimum Requirement	Specification
Adhesive Strength	Substrate Failure	ASTM D4541
Hardness, Shore D	≥80	ASTM D2240
Compressive Strength	>10,000 psi	ASTM D695
Flexural Strength	>9,00 psi	ASTM D790
Tensile Strength	>6,000 psi	ASTM D638

b. Shall be specifically designed for applications onto properly repaired concrete surfaces.

~~2.2 POLYMER SYSTEMS~~

~~A. REFERENCES~~
~~ASTM D543 - Resistance of Plastics to Chemical Reagents.~~
~~ASTM D638 - Tensile Properties of Plastics.~~
~~ASTM D695 - Compressive Properties of Rigid Plastics.~~
~~ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abrader~~

~~ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages~~
~~ASTM D7234 - Pull-off Strength of Coatings Using a Portable Adhesion Tester. SSPC SP-13/NACE No. 6 – Surface Preparation of Concrete~~
~~NACE SP0188 - For performing holiday detection~~
~~CIGMAT - Evaluation of Liner System for Wastewater Concrete and Clay Brick Facilities~~
~~ASTM G210 - Severe Wastewater Analysis Test~~

~~B. REPAIR AND RESURFACING PRODUCTS~~

~~1. Repair products shall be used to fill voids, bug holes, and/or smooth transitions between components prior to the installation of the SYSTEM. Repair materials must be properly cured and must be compatible with the SYSTEM and shall be used and applied in accordance with the manufacturer's recommended requirements.~~
~~2. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and to rebuild severely deteriorated structures.~~
~~3. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications:~~
~~a. 100% solids, solvent-free polymer grout specifically formulated for epoxy polymer top coating compatibility.~~
~~b. Factory blended, rapid setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied maybe approved if specifically formulated to be suitable for polymer top coating with the specified polymer product. The length of resurfacing material cure required before polymer top-coating, shall be as recommended by the manufacturer.~~
~~c. All repair and resurfacing materials should be properly cured and prepared for surface top-coat application.~~

~~C. SYSTEM APPLICATION~~

~~1. Polymer System manufacturer shall provide System application procedures and requirements.~~
~~2. Manufacturer recommended and approved application equipment.~~
~~3. Hard to reach areas, primer application and touch-up may be performed using hand tools.~~

2.3 MANHOLE CHIMNEY SEALS

A. REFERENCES

ASTM C923-07 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM D412-06a Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -Tension
ASTM D638-03 Standard Test Method for Tensile Properties of Plastics
ASTM D395-03 Standard Test Methods for Rubber Property - Compression Set
ASTM - D790 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D695-02a Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D2240-05 Standard Test Method for Rubber Property - Durometer Hardness
ASTM D-638-03 Standard Test Method for Tensile Properties of Plastics

ASTM D790-07 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D2344/D2344M-00(2006) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM: D-3039 ASTM D3039/D3039M-00(2006) Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

B. GENERAL
1. Manhole frame sealing includes the sealing of the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal flexible seal.
2. The seal shall be designed to prevent leakage of water into the manhole.

C. POLYMER CHIMNEY SEAL
1. Polymer manhole chimney seals shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but are not limited to lifting rings, brick and/or block material that may have been used to achieve grade.
2. The polymer chimney seal material shall be corrosion resistant.
3. Mil thickness shall be determined by the manufacturer. Refer to section 1.1.F for design requirements.
4. The polymer chimney seal may require a primer resin applied to the entire surface before application. The sealing system shall line the interior of the adjustment area from the cone/top of the manhole and onto the inside of the casting. If the manhole has been relined prior to the seal installation the seal shall cover a minimum of 6 vertical inches to cover casting cone interface.

2.4 MANHOLE STEPS

A. REFERENCES

ASTM C478-07 Standard Specification for Pre-cast Reinforced Concrete Manhole Sections

ASTM A615/A615M-07 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

AASHTO M199

A. MATERIAL
1. Reinforcing bar manhole steps shall conform to the minimum requirements of ASTM C478, Para, 11. The reinforcing bar shall be grade 60, deformed 1/2inch reinforcing bar conforming to the requirements of ASTM A615

PART 3 - EXECUTION

A. GENERAL
1. Maintain all flow in the manhole throughout duration of project.
2. Provide 48 hour notice to the Owner prior to start of work for Inspector to review and document materials and equipment to be used, for Quality Assurance and testing requirements.

B. MANHOLE PREPARATION

1. Bypass Pump sewage, in the manhole, as required
2. Clean interior surfaces of manhole of debris, dirt, oil, grease, remains of old coating materials, and any other extraneous materials.
3. Pressure wash manhole walls to remove loose mortar, concrete and debris. Pressure washing levels, used for cleaning, shall be as recommended by the manufacturer.
4. Repair irregularities in manhole using materials, compatible with proposed resurfacing material, as recommended by the manufacturer.
5. Repair leakage in manhole using materials, compatible with proposed resurfacing material, specified in these contract specifications.
6. Trim and grout incoming laterals and pipes as required and/or specified.
7. Remove debris from manhole and incoming sewer connections.
    a. Handle cleaning water to prevent water and residue from causing damage.
    b. Do not discharge debris downstream through the sanitary sewer system.
    c. Filter solids-laden water through a de-silting device.
    d. Properly dispose of debris and residue from cleaning and other construction operations in a manner satisfactory to Owner and authority having jurisdiction over area where work site is located.

3.1 CEMENTITIOUS RESTORATION

A. GENERAL

1. Before starting any patch work or liner application install a perforated device, catch bucket, or other straining device to prevent construction debris from entering downstream pipes.
2. Provide all materials, labor, equipment, etc. required to perform the work as recommended by the manufacturer and as required by the contract documents.
3. Inspect each manhole to determine methods of stopping leaks and applying patch repairs.
4. Confirm that all material to be used, for the rehabilitation of the manhole are compatible with each other. Do not use any materials that have not been verified for compatibility.

B. SEALING ACTIVE LEAKS

1. The work consists of hand applying a dry quick-setting cementitious mix designed to instantly stop running water or seepage in all types of concrete and masonry structures. The applicator shall apply material in accordance with manufacturer's recommendations in accordance with the following minimum specifications.
    a. The area to be repaired must be clean and free of all debris per the guidelines set forth elsewhere in these specifications.
    b. Once cleaned, prepare crack or hole by chipping out loose material to a minimum depth recommended.
    c. As recommended by the manufacturer, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped.
    d. Proper application should not require any special mixing of product or special curing requirements after application.
    e. Use of Oil-free Oakum Water Plugs.
        1) Saturate oakum with resin following approved submittals.
        2) Use additives as required.
        3) Place and cure following manufacturer's recommendations.

C. INVERT REPAIR

1. The work consists of hand mixing and applying a rapid setting, high early strength, non-shrink patching material to fill all large voids and repair manhole channels prior to spray lining of the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning.
    a. The area to be repaired must be cleaned and free of all debris per the guidelines.
    b. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patching materials.
    c. Cementitious material shall be mixed in a mortar tub or 5 gallon pail with water per manufacturer's specifications.
    d. Once mixed to proper consistency, the materials shall be applied to the invert or void areas by hand or trowel. In invert applications, care should be taken to not apply excessive material in the channel, which could restrict flow. Once applied, materials should be smoothed either by hand or trowel in order to facilitate flow.
    e. Flows in channels shall be re-established when material has cured enough to withstand the flow as determined by the manufacturer.

D. APPLICATION OF CEMENTITIOUS MANHOLE LINER
5. The work consists of troweling, spray applying and/or centrifugally spin-casting a cementitious based liner to the inside of the existing manhole. The necessary equipment and application methods to apply the cementitious based liner materials shall be only as recommended and approved by the material manufacturer.
6. Material shall be mixed with water in accordance with manufacturer's specifications. Once mixed to proper consistency, the materials shall be pumped via a rotor-stator style progressive cavity pump through a material plaster hose for delivery to the appropriate and / or selected application device. The equipment shall be as recommended by the manufacturer, matched for the material being applied.
7. If a chimney seal is required in conjunction with the lining technology, the Contractor should contact the chimney seal manufacturer to determine the proper preparation required for effectively installing the chimney seal after the coating has been applied and cured.

E. SPRAY APPLICATION OF THE CEMENTITIOUS MATERIAL.
1. All material shall be applied and finished, by the Contractor, using equipment specified by the manufacturer.
    a. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
    b. Spraying shall be performed by starting at the manhole invert and progressing up the wall to the corbel and chimney areas.
    c. Material shall be applied to a specified uniform minimum thickness as required by the manufacturer and as necessary for proper curing and application. Material shall be applied to the bench area in such a manner as to provide for proper drainage.
    d. Material shall be troweled smooth to compact material into voids. A brush or broom finish may be applied when a top coating is desired.

F. SPIN CASTING APPLICATION OF THE CEMENTITIOUS MATERIAL
1. All material shall be applied and finished by the Contractor using equipment specified by the manufacturer.
    a. Material hose shall be coupled to a high speed rotating applicator device. The rotating casting applicator shall then be positioned within the center of the manhole

at either the top of the manhole chimney or the lowest point elevation corresponding to the junction of the manhole bench and walls.

b. The high speed rotating applicator shall then be initialized and pumping of the material shall commence. As the mortar begins to be centrifugally cast evenly around the interior of the manhole, the rotating applicator head shall be raised and /or lowered at a controlled retrieval speed conducive to providing a uniform material thickness on the manhole walls.
c. Controlled multiple passes are then made until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, simply stop the retrieval of the applicator head until flows are recommenced.
d. Material thickness may be verified at any point with a depth gauge and shall be no less than a uniform ½-inch. If additional material is required at any level, the rotating applicator head shall be placed at that level and application shall recommence until that area is thickened.
e. Material shall be applied only when manhole is in a saturated surface dry (SSD) state, with no visible water dripping or running over the manhole walls.
f. The low-velocity spray nozzle and the centrifugal spin casting head may be used in conjunction to facilitate uniform application of the mortar material to irregularities in the contour of the manhole walls and bench areas.
g. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify manhole wall. A brush or broom finish may be applied if top coating is desired.
h. Curing will take place once the manhole cover has been replaced. It is important that the manhole cover is replaced no more than 10-20 minutes after troweling is complete to avoid moisture loss in the material due to sunlight and winds.
i. Material shall not be applied during freezing weather conditions. Material shall not be placed when the ambient temperature is 37 degrees Fahrenheit and falling or when the temperature is anticipated to fall below 32 degrees Fahrenheit during 24 hours.

G. TESTING AND ACCEPTANCE
1. Visual inspection – verify no infiltration, cracks, or loose material.
2. Vacuum Testing, as required in the contract documents
3. Cementitious Material Physical Property Testing

3.2 EPOXY TOPCOAT

A. GENERAL

1. Contractor shall comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.
2. Cementitious lining materials shall be properly cured according to manufacturer's requirements prior to epoxy coating application. Coating material must be compatible with the Cementous lining material.
3. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.
4. Temperature of the surface to be coated should be maintained between 40 deg F and 120 deg F or as recommended manufacturer.
5. Specified surfaces should be shielded to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperatures do exist, coating

application shall be scheduled when the temperature is falling and not rising or as recommended by the manufacturer.

B. APPLICATION OF EPOXY TOPCOAT PRODUCT

1. Application procedures shall conform to the recommendations of the epoxy coating product manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
2. Spray equipment shall be specifically designed to accurately ratio, apply the epoxy coating product, shall be in proper working order and shall be as recommended by the product manufacturer.
3. Contractors qualified in accordance with these specifications shall perform all aspects of epoxy coating product installation.
4. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum as recommended by the manufacturer to meet the requirements of these contract documents or as recommended by the manufacturer.
5. Subsequent top coating or additional coats of the epoxy coating product shall occur within the product's recoat time. Additional surface preparation procedures will be required if this recoat time is exceeded. The epoxy manufacturer's re-coat time for the specific application, based on temperature and project conditions, shall be strictly followed by the applicator.
6. The epoxy coating product shall mechanically bond with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to affect this bond shall be as recommended by the epoxy coating product manufacturer. No hollow spots will be accepted.
7. Contractor must submit manufacturers recommended method for terminating a coating or lining in a manhole.
8. If required sewage flow shall be stopped, bypassed, or diverted for application of the polymer coating product to the invert and interface with pipe materials.

C. TESTING AND ACCEPTANCE

1. Visual Inspection - Installed liner system shall be completely free of pinholes and hollow spots/voids and other defects that will reduce the life expectancy of the applied system.
2. Film thickness Measurements – (either wet or dry) Liner thickness shall be the minimum value as specified in the contract documents or as recommended by the manufacturer.
3. Holiday Detection Test (Spark Testing), to identify pinholes, thin material and any defects that will affect the life of the installed system.
4. Adhesion Testing – To verify that the system has consistently mechanically bonded to the host structure.

~~3.2 POLYMER LINERS~~

~~A. GENERAL~~

~~1. Contractor shall comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.~~

2. New Portland cement concrete structures shall have cured a minimum of 28 days since manufacture prior to commencing coating installation or as recommended by the manufacturer.
3. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.
4. Temperature of the surface to be coated should be maintained between 40 deg F and 120 deg F or as recommended manufacturer.
5. Specified surfaces should be shielded to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperatures do exist, coating application shall be scheduled when the temperature is falling and not rising or as recommended by the manufacturer.
6. Prior to commencing surface preparation, Contractor shall inspect all surfaces specified to receive the coating and notify Owner, in writing, of any noticeable disparity in the site, structure or surfaces which may interfere with the work, use of materials or procedures as specified herein.

B. SURFACE PREPARATION
1. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be entirely removed.
2. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that only sound substrate remains.
3. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the specified polymer coating product, as recommended by the manufacturer.
4. Surface preparation methods or combination of methods that may be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shot blasting, grinding, scarifying, detergent water cleaning, hot water blasting and others as described in NACE No. 6/SSPC SP-13. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface with sufficient profile to promote an acceptable bond with the specified polymer coating.
5. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for top-coating with the epoxy coating product. The manufacturer shall verify the product compatibility, in writing, to the Owner.

C. APPLICATION OF POLYMER COATING PRODUCT
1. Application procedures shall conform to the recommendations of the epoxy coating product manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
2. Spray equipment shall be specifically designed to accurately ratio, apply the polymer coating product, shall be in proper working order and shall be as recommended by the product manufacturer.
3. Contractors qualified in accordance with these specifications shall perform all aspects of polymer coating product installation.
4. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum as recommended by the manufacturer to meet the requirements of these contract documents.
5. Subsequent top coating or additional coats of the polymer coating product shall occur within the product's recoat time. Additional surface preparation procedures will be required if this recoat time is exceeded. The polymer manufacturer's re-coat time for the

specific application, based on temperature and project conditions, shall be strictly followed by the applicator.

6. The polymer coating product shall mechanically bond with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to affect this bond shall be as recommended by the polymer coating product manufacturer. No hollow spots will be accepted.
7. Contractor must submit manufacturers recommended method for terminating a coating or lining in a manhole.
8. If required sewage flow shall be stopped, bypassed, or diverted for application of the polymer coating product to the invert and interface with pipe materials.

D. TESTING AND ACCEPTANCE

1. Visual Inspection - Installed liner system shall be completely free of pinholes and hollow spots/voids and other defects that will reduce the life expectancy of the applied system.
2. Film thickness Measurements – (either wet or dry) Liner thickness shall be the minimum value as specified in the contract documents.
3. Holiday Detection Test (Spark Testing), to identify pinholes, thin material and any defects that will affect the life of the installed system.
4. Adhesion Testing – To verify that the system has consistently mechanically bonded to the host structure.

3.3 MANHOLE CHIMNEY SEALS

A. POLYMER CHIMNEY SEAL

1. Preparation of the chimney surface and casting may include using high pressure water, sandblasting, wire brushing, or other methods as described by the manufacturer, to ensure a clean surface.
2. The polymer chimney seal shall require the proper mixing of several components, is recommended by the manufacture. If a primer is required, ensure that all surfaces are clean and dry before applying. After proper curing of the primer, the polymer chimney seal may be applied evenly by brush over the entire chimney area, including the frame joint area and the area above the manhole cone including all extensions to the chimney area.
3. Installation procedures shall be in accordance with the manufacturer's recommended instructions.
4. TESTING AND ACCEPTANCE
    a. Visual Inspection - Final liner system shall be completely free of pinholes or voids.

3.4 MANHOLE STEPS

A. Manhole steps shall be driven into pre-cast or drilled holes. Steps shall be installed no more than 16 inches apart vertically on the interior of the manhole wall at a point 4" below the base flange of the manhole casting.

B. Measurement shall be for each manhole step provided

C. Payment shall be at the price per each Bid in the Proposal.

1. Payment includes the removal and replacement of manhole steps per each Bid in the Proposal.

3.5 QUALITY ASSURANCE AND TESTING

A. GENERAL
1. The Contractor shall test the installed SYSTEM's as specified by these contract documents. 10% of the installed SYSTEM's shall be tested using a testing procedure as further delineated below. If more than 5% of the tested SYSTEM's fail the test than an additional 10% of the manholes are selected for further testing. This process continues until the SYSTEM's tested meet the requirements of these contract documents, to the satisfaction of the Owner.
2. All testing shall conform to these contract specifications and the submitted PWS.

B. CHAIN OF CUSTODY
1. The Contractor shall seek to perform all testing in the presence of the Owner's representative. Documentation on all areas tested, results and necessary repairs made shall be provided to the Owner in writing by Contractor.
2. Visual Inspection
   a. All manholes shall be visually inspected. Any leakage into the manhole in areas where SYSTEM's were installed by the Contractor shall be identified.
3. Film thickness Measurements
   a. Where applicable and specified during application a wet film thickness gauge, meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Measurements shall be taken, in the presents of the Owner's representative, documented and attested to by Contractor for submission to Owner.
4. Holiday Detection Test
   a. Where specified Holiday Detection shall be performed for all coating systems installed in corrosive environments.
   b. After the epoxy coating product have set in accordance with manufacturer instructions, all surfaces shall be inspected for holidays with high-voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection.
   c. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional coating can be hand applied to the repair area.
   d. All touch-up/repair procedures shall follow the coating manufacturer's recommendations.
   e. Documentation on areas tested, results and repairs made shall be provided to the Owner, in writing, by Contractor.
5. Adhesion Testing
   a. Where specified a minimum of 10% of the manholes coated shall be tested for adhesion/bond of the coating to the substrate. Testing shall be conducted in accordance with ASTM D4541, ASTM D7234, or NACE SP018. Owner's representative shall select the manholes to be tested.
   b. A minimum of three (3) - 50 mm dollies shall be affixed to the coated surface at the cone area, mid section and at the bottom of the structure or in areas suspect from non-destructive evaluation and testing the adhesive used to attach the dollies to the coating shall be rapid setting with tensile strengths in excess of the coating product and permitted to cure in accordance with manufacturer recommendations. The coating and dollies shall be adequately prepared to receive the adhesive.

c. Failure of the dolly adhesive shall be deemed a non-test and require retesting. Prior to performing the pull test, the coating shall be scored to the substrate by mechanical means without disturbing the dolly or bond within the test area.
d. Two of the three adhesion pulls shall exceed 300 psi or concrete failure with more than 50% of the subsurface adhered to the coating.
e. Should a structure fail to achieve two successful pulls as described above, additional testing shall be performed at the discretion of the Owner. Any areas detected to have inadequate bond strength shall be evaluated by the Owner.
f. Further bond tests may be performed in that area to determine the extent of potentially deficient bonded area and repairs shall be made by Contractor.

3.6 SAMPLE BID ITEMS

A. Mobilization – Lump Sum – Includes all PWS info, submittals, safety plan, as built drawings, test samples and mobilization/demobilization of labor, equipment, and materials to the project site.

B. SYSTEM (One for each SYSTEM Specified)– Lump Sum – per each vertical foot including all labor, materials and equipment required by the Contractor to furnish a leak proof manhole to the Owner, complete.

C. SYSTEM Inspector Training (One for each SYSTEM Specified) – price per day – includes the cost of all labor, equipment and materials required to train the Owner's inspectors on the SYSTEM technology, at the Owner's project location.

D. Replace Manhole Frame and Cover – Lump Sum – per each manhole including all labor, materials and equipment required by the Contractor to remove and dispose of the existing manhole frame and cover and furnish and install a new manhole frame and cover to the Owner, complete.

E. Manhole Adjustment Materials – per vertical inch – includes all labor, equipment and materials required, by the Contractor, to adjust each manhole as required by the Owner, complete.
1. Bench Rebuild – Some manholes may require structural construction of a bench to promote proper flow. Merely lining the existing flat bench is not consistent with good rehabilitation practice.

F. Manhole Steps – per each – includes all labor, equipment and materials required, by the Contractor, to install each manhole step as required by the Owner, complete.

END OF SECTION